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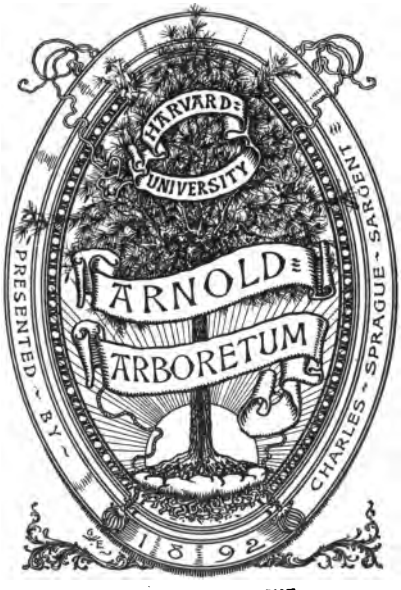

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TRANSACTIONS

OF THE

SCOTTISH ARBORICULTURAL SOCIETY.

VOL. II.

EDITED,
UNDER DIRECTION OF THE COMMITTEE.

EDINBURGH:
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TRANSACTIONS

OF THE

SCOTTISH ARBORICULTURAL SOCIETY.

I.—*Introductory Remarks.*

In introducing to members and the public another part of the Transactions of the Scottish Arboricultural Society, the Committee are gratified to find that the previous portions of this department of the Society's labours have been duly appreciated.

Though Arboriculture has not, like its sister sciences Agriculture and Horticulture, occupied the attention of all classes from the earliest records of human history till the present day, it is hoped that the time has now arrived when a greater degree of interest will be felt in its study and pursuit by the highest and the humblest in the land—the most erudite naturalist and the simplest utilitarian.

The cultivation of field and garden crops for food is no doubt of prime importance, inasmuch as the sustenance of man and beast—not to speak of the luxuries required by mankind in an advanced state of civilisation — is dependent on its successful prosecution. To man, however, as soon as he is raised above the rank of the lowest savage, the natural objects from which he can derive shelter from the vicissitudes of season, as well as the simplest implements of husbandry and domestic economy, cannot be passed over without some interest and labour to procure the raw material, and afterwards fashion it so as best will answer the purpose for which it is to be applied. Travellers who have first visited the homes of uncivilised races find their huts and clothing manufactured from the bark and fibre of the various trees and shrubs which form their forests, and on the coasts their canoes shaped out of the solid timber, after its integuments have been removed.

It is needless to trace the progress made by mankind from this pristine condition to the advanced civilisation of the present day in this and other departments of knowledge and industry. Volumes might be written to describe the gradual steps by which, like the acorn to the sturdy monarch of the forest, the fragile kyack of the Esquimaux, and rude canoe of the South Sea Islander, rose to the leviathan of the British isles, and the log-hut of the

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Red Indian to the stately mansion of the American millionaire,—improvements in which arboriculture in some of its aspects bore no mean part.

While the naturalist was examining the structure of the trees growing in his native forests, or those belonging to other regions of the earth, the builder and mechanic were testing the qualities of the material submitted to them, and judging in what way they could be made most serviceable to them, and that with the least cost of time and labour. No less would the proprietors and tenants of the ground be desirous of making themselves acquainted with the soil and climate that suited each species of tree, but also the mode of cultivation most likely to be successful in raising a supply of the species found most useful for building, and the thousand other purposes to which the solid tree and its appendages can be applied.

While arboriculture, with the subsidiary arts and sciences to which it is more or less allied, has been making progress, and engrossing greater attention from the landed proprietor, employer of labour, and mechanic, much yet remains to place it in the position it should occupy, whether in a scientific or practical point of view. The movements at home and abroad show that this neglect which formerly existed is passing away; and we trust that erelong the arboriculturist will occupy the same position everywhere granted to the agriculturist and horticulturist,—as all should be mutual helpmeets instead of rivals. Government has of late given considerable attention to the trees of India and our other foreign dependencies, with a view of ascertaining the respective values of their lumber-trees, and thus aiding their populations in promoting the arts of civilised life. Private enterprise is doing the same in Australia and the more distant parts of the empire; and it cannot be permitted that the mother country—carrying on with pristine vigour every enterprise tending to ameliorate the condition of her inhabitants—should allow herself to be outstripped by the energy of her daughters.

To further such efforts the Scottish Arboricultural Society was formed a few years ago, and the objects it aims at are well worthy the notice of all who are interested in the management of our woods, whether for profit or pleasure. The "Transactions" of previous years bear testimony to the zeal and ability with which the Society has engaged in its labours, and should be an inducement to lead those who are not similarly engaged to put forth a helping hand in the work. The forester has numerous and arduous duties to discharge, from the rearing of the infant germ till the matured tree is fit for the purposes of the carpenter and builder; and, as we have already said, all classes of the community are more or less interested in his operations, and thus called on to countenance his endeavours in advancing the art.

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II.—*On Thinning and General Management of Forest Trees.* By "JUSTITIA."*

IN regard to park or ornamental trees, each proprietor follows a plan of management in accordance with his own taste, without, in general, making any very exact calculation respecting profit, and often allowing them to grow as they incline. But the remarks we have to make are intended to assist the planter in raising trees in a manner to render them of greater value—both as timber and for shelter—than they can reach if neglected or improperly directed. Explanation on this subject is the more necessary, as we have no public examples afforded by which the different systems might be compared, and the most advantageous method selected and adopted. Though the late Mr Loudon, London, informed me, when in Scotland in 1841—and we learn from the writings of Mr Billington that he likewise applied—that on application to Government to get trees in some of the royal parks to experiment on as a school for the use of the kingdom, this request was not granted, which is much to be regretted, as the example of such eminent men, when openly displayed, would have dispelled much of the ignorance which prevails on the subject. But experiments might be made on a more moderate scale than was contemplated by the foresaid gentlemen. If liberty were granted, there are sufficient plantations near Edinburgh on which experiments might be practised with good effect. It would undoubtedly be beneficial were the proprietors of these to submit a portion of the young trees to scientific management. The Town Council, likewise, might confer advantage were they to allow some of the young trees in the Meadows—say every fourth tree or so—to be so treated. Mr Loudon mentions in his Magazine (vol. xviii.), that when in Scotland in 1841, the Duke of Hamilton's young plantations had much need of thinning, and a better system of pruning; and from what I have seen of the pruning in the Duke of Buccleuch's plantations at Dalkeith, it is not very scientific, except in the case of a deodar cedar, by Mr M'Intosh, when superintending the gardens. The noblemen may deserve no blame in this matter, having other duties to occupy their thoughts; but it is to be desired that these things were better conducted in high places, as such notable examples are likely to induce imitators.

Many theories have been promulgated on the pruning of forest trees, some by practical men, some by mere theorists or persons of defective power of observation, as their methods are often very injurious in application. It is hoped that the experience of practical men, and the influence of arboricultural societies, may banish

* The author of this essay did not give his name, and the secretary, though he made inquiry in various ways, has not been able to ascertain it.

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false theories, and institute a scientific and permanent system. Intelligent men, having acquired the scientific elements of the system, will find no difficulty in prosecuting it successfully, when we may expect improvement to an extent which shall be felt to be nationally important.

It is very common for people in our greedy world to underrate any object which does not yield an immediate return of profit. Being incapable of cherishing generosity, such persons concentrate their desires in mere personal gain, grudging that wealth should recede from them, though, by being removed only a step, it settles on their offspring. Hence the backwardness in many to plant trees, or pay the expense of other improvements, however obvious the beneficial result may be in futurity. To those who can part with money, the planting of land is by no means so unprofitable as the narrow calculator may imagine. Shelter is thereby afforded, and of course the pasture and crops adjacent improved, which may stand as interest for the money; and when arrived at the strength to be used in mechanical arts, plantations have often proved a very remunerative investment of capital, even during the lifetime of the planter.

The intention I have in writing at present is to point out the plan I think most conducive to the health and consequent growth of the tree. Arboricultural societies are now instituted in Edinburgh, Brechin, and Peebles, and from these I hope much good may emanate. Communicating to each other, and to the public, their experience, and mutually weighing the different notions and practical facts, a system may be established which may gain credit the more readily by having their sanction impressed on it. The system which makes the tree attain the greatest magnitude, with sound timber, in the shortest time, is evidently the best. The plan which my experience (a pretty extensive course of experiment) has led me to adopt is, to shorten the branches till the tree is about 30 feet high before close pruning commences, unless shelter is required: this keeps the trees in a conical form, like the poplar, silver and spruce firs, larch, and all fast growers. This method makes trees which are generally considered to be of slow growth rise more rapidly than any other mode of treatment. The oak, for example, is considered by almost all writers as of slow growth. I at one time was of that belief till experiment proved the error. No top-rooted trees should be cut in the roots in the nursery or field: their growth is thereby retarded. I have seen these make 9 inches the first year; but if the roots are cut, they remain stunted, and the others overtop them, and they are therefore declared slow in growth. Last season an oak about 10 feet high had a growth of 4 feet 10 inches at an altitude of 700 feet. By giving the oak the same configuration as the poplar, &c., this rapidity of growth is effected. The shortening, as above stated,

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to be continued till 40 feet high, which will afford heads conformable to a clean bole 40 feet in height.

The shortening of the branches of young trees is in the following manner:—Whatever the length of the leading shoot may be, shorten those next it to half its length, allowing them gradually to widen downwards, retaining the conical form till close pruning commences, which should take place only late in spring. As to neglected or hedgerow trees, these require to be shortened at a greater proportional distance from the trunk: the larger the size, the greater the length or distance from the body of the tree. During this operation, it is necessary to have one below to direct, who must observe the form from different sides, lest the top should not be equally extended on all sides. A nobleman informed me that Mr Barron, in England, placed a pole near the top of the tree with two ropes attached, cutting off all without the angle of these ropes; but I convinced his Lordship that in practice the work was more accurately and expeditiously executed by the help of a good eye. It is very hurtful to prune the foresaid trees close.

In regard to ornamental trees, a little pruning does not injure their shape. I have observed that they grow higher, and spread wider likewise, after being pruned, than they otherwise could, from the additional vigour thereby imparted. Pruning, conducted as it ought to be, is of the first importance in rearing trees to the highest value and quality; but it must be averred that proper management is not often found, as I can attest from a pretty extensive survey over the country from Sutherland to Manchester.

The growth even of the poplar, spruce fir, and larch, is accelerated by a little shortening. The branches are thereby rendered cleaner in the bark, and imbibe a higher temperature than when neglected, and, moreover, a greater number can stand on the same ground.

The ascent and descent of the sap is regulated by demonstrable laws, the atmosphere being the agent which enforces movement. Arising first from the roots, it extends to the extremities at the top: purified and augmented by the atmosphere, it again descends, and in turn remounts with an activity proportioned to the heat, which affects it in the same manner as water is affected by it, influenced, of course, at the same time by the health of the tree and the situation in which it is placed. On the sap reaching the top, buds spring and leaves shoot forth, which leaves, by shortening the branches, are greatly increased in health and size; and this fresh profuse foliage is of the utmost value in elaborating the juices, imbibing nourishment from the atmosphere, augmenting the quantity of descending sap, and thereby enlarging the woody fibre and other tissues which enter into the composition of the trunk.

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Thinning of plantations is the part of the forester's duty which is most generally neglected. Plantations suffer more from the want of consistent thinning than even from the want of pruning, though they must be combined if success is to be secured to the exertions of the planter. Before we attempt to thin or prune, we must arrange the kind of trees which shall remain after thinning, and the distance required for full-sized timber. In the large fir plantations in the north, the most common practice is to thin trees planted at the distance of 4 feet to the distance of 16 feet; but to plant at 4 feet in every kind of soil and altitude is improper. Planting should be regulated partly by the height the trees are expected to arrive at,—suppose 60, 70, or 80 feet, or any other height,—and the kinds of trees, and the shape they will naturally afterwards assume, calculating particularly for the advantage of those destined to be the ultimate crop. I had long to plant according to directions given in some extensive plantations; the order, one row of larch, next a row of Scots fir, so on alternately; but it is not a good way of planting for thinning to leave an equal number of each.

Sufficient attention in part is paid to plantations generally in the North. Along the rivers and lakes the fir tribes thrive remarkably well; and these localities would likewise be suitable for new pines, as little frost occurs, especially on the western side. Besides thinning, fencing and draining are essential, and often neglected. Suppose trees to be planted at 3 or 3½ feet, or any other distance, belts and large plantations should be kept thinnest on the outside, for shelter to the interior. If planted at 3 feet, the first thinning should commence when the trees are about 12 feet high, which being completed, they will stand at 6 feet distance; when 20 feet, the second; and when they attain 36 feet, the third thinning should begin. If planted 4 feet distant, the first thinning to commence when 14, the second when 24 feet in height. Larch at 16 feet distance have space to reach full-sized timber. But other calculations are requisite besides the height of the trees. In thinning neglected plantations, care must be taken not to thin too much, not to overdo the work, which should be done when spring is well advanced, and at two or three different periods of years.

A full statement on the subject is given in the "Gardener's Chronicle, 1857," by Mr J. Rutherford: some of the remarks are good, others questionable. Mr Brown also writes of it in his "Forester."

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III.—*On Dry-Rot in Larch and Spruce Fir.* By James M'Neill, Forester, Abercairny, Crieff.

Heat, air, light, and moisture, are essential agents in the growth and development of trees, and if these are given according to their constitutional requirements, with adaptation of soil and site, there can be no valid reason given why they should not, in the ordinary course of nature, grow and become fully developed after their kind. We shall do well, therefore, in endeavouring to learn the source or origin of any particular disease manifested in trees, to ascertain, in the first place, whether these primary conditions of all vegetable growth have been given to them.

Premature decay or *dry-rot* is, and has been, a prevalent disease in larch and spruce fir—what, then, is the cause, source, or origin of this particular disease? Before attempting to answer this question, we shall take a cursory glance, in passing, of the organs of nutrition, and endeavour to make ourselves acquainted with the operation of their several functions; as, with the knowledge thus acquired, we shall be the better enabled to judge of any debility or constitutional derangement that may come under our observation. The organs of nutrition, then, are the root, the stem and branches, and the leaves, without which the vital functions of plants cannot be carried on, and upon their healthful action depend the growth and sound development of trees. The roots of trees are furnished with a number of slender fibres, with spongioles attached, and by which moisture, or food in solution, is imbibed, and thence transmitted through the other parts of the root to the stem, branches, and leaves; the superfluous air and moisture are given off by the leaves and other green parts, carbonic acid and other gases absorbed; and here what may be called *vital chemistry* is brought into action, stimulated by solar light and heat, and a particular elaboration takes place by which the sap is converted into what is termed the *proper juice*, or food of plants. It now descends from the leaves through the bark, assimilating, consolidating, and depositing its nutritious principles in all the growing parts of the vegetable structure. We have thus learned the *importance* of the organs of nutrition, and having thus learned somewhat of their importance, What is the practical lesson deducible from this theoretical knowledge? Unquestionably this, that trees should have at all times sufficient light and air given them to retain their foliage, the leaves and other green parts being the chief seat of assimilation; and without a sufficiency of these being exposed to the stimulating agency of solar light, the proper juice or food of plants will not be sufficiently elaborated, and hence cannot become *fully*

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matured wood; and to this cause chiefly I would ascribe premature decay or dry-rot in larch and spruce fir.

I think I shall be borne out in the assertion, that hitherto arboriculture, both in theory and practice, has been the very opposite of this. Promiscuous plantations were formed and planted without any attention having been paid either to drainage or the adaptation of the plant to the soil,—the chief object seemingly having been to fill up the ground well with some kind of tree or other; and from having been actuated by a false economy, nothing further done till once they should be deemed *of use*, except some dilatory thinnings, that might be made in the most convenient situations for fencing and other estate purposes, and any additional assistance got from nature, by the one tree killing the other. Such I consider to be a fair estimate of arboricultural proceedings for the greater part of the last century; and could anything be more calculated to defeat the object that ought to have been in view, viz., the production of sound timber, than such a manner of procedure? Even a tree fully matured, and having all the advantages of light and air to consolidate its tissues, with adaptation of soil and site, begins to give way in the *heartwood first*, when, in the ordinary course of nature, it begins to give way. What, then, I would ask, could reasonably be expected from trees that were, so to speak, in a state of *etiolation* for the first thirty years of their existence? The *actinic* principle inherent in the sunbeam acts with redoubled energy, owing to the exclusion of the *luminous*, which such a state implies; the trees are disproportionately drawn up in consequence, the fibro-vascular and other tissues are not consolidated, heartwood is prematurely formed, and dry-rot follows in its wake, the one tree lashes the other, and the epidermis is injured by the same cause. The absorbing power of the roots, and the decomposing power of the leaves, become, in consequence, disproportioned; the various tissues are therefore surcharged with diluted sap: hence ulcers, or running sores. The frosts and cutting winds of winter kill back the young, succulent, immature shoots. The circulation of sap is therefore languid, and in summer the larch becomes infested with a species of *beetle*, whose ravages destroy the foliage, thus destroying, or at least impairing, the wood-producing surface or power of assimilation. The trees will have rapidly run into seed, and after making an abortive attempt to exercise the functions of their nature, dry up and die. Nay more, the cones of such trees will have been gathered, the seed extracted and sown, and thus dry-rot, with all its correlative diseases, transmitted and perpetuated; for we cannot expect sound offspring from diseased or debilitated parents. Such are a few of the evils that will inevitably be brought about by having trees grown in conditions inimical to their sound development.

All our forest trees are exogenous or outward growing, layer

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above layer, cone above cone, so to speak: hence, if the assimilation is incomplete, if the proper juice is not sufficiently elaborated in the first stages of their growth—and this must be the case where solar light and an assimilating surface are deficient—it follows that they will be loose in texture, that the various tissues will not be consolidated, and that, therefore, a sure foundation is laid for dry-rot or premature decay. I have no hesitation, therefore, in asserting, that the most important period in the management of larch and spruce plantations is from the time they receive their first thinning (which may be at eight or ten years, according to circumstances) till they attain the age of thirty or thirty-five years. During this period they will require the most assiduous attention, if sound timber is wished, the desideratum being to preserve shelter, and, at the same time, to have the trees thinned out, so that they may stand free of each other, and thus admit light and air all around them; and I am afraid that, as yet, arboriculturists do not entertain an adequate conception of the *importance* of attending to this matter, for if once coniferous trees are allowed to lose their foliage by being over crowded, they never regain it, and hence lose their power of assimilation. From not paying attention to these plain deductions, trees are grown in a state of *etiolation* in the first stages of their growth, being mere poles with little assimilating power, and then an effort is made to conform to the light of science when *it is too late;* for though we should then succeed in giving trees an assimilating surface proportionate to their requirements, we shall only succeed in *encrusting* with sound timber a portion of immature wood, which wanted the conditions essential to its consolidation, and was hence inherently prone to premature decay or dry-rot.

Taking the above remarks in connection, and bearing in mind that our forest trees are *exogens*, and therefore outward-growing, we are enabled to understand why trees, externally sound and in apparent good health, are often found to be rotten in the heart, and for every purpose of utility worthless when cut up. Moreover, a plantation which had been neglected in its earlier stages of growth, may afterwards, by judicious management, be so far recovered as to appear externally sound, no outward manifestation being given of the rottenness within. Thinness of foliage, premature and excessive cone-bearing, with fog or moss adhering to the body and lateral branches of trees, are considered to be indicative of this disease; but these are, *properly speaking*, the signs of *old age* or *maturity* prematurely developed; and in whatever plantation thus manifested, I should deem it irrecoverable. I do not deem it of importance to give a *diagram* of this disease, as every practical forester must be conversant with the *reality* in its incipient and fully developed stages; nor do I consider it of importance to treat particularly of *age* or *altitude*,

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my belief being, that we shall have the same results brought about by the infringement of a general law of vegetable growth, at whatever age or altitude, modified in intensity, I have no doubt, by these several circumstances. I shall now make a few remarks on the prevention of *dry-rot*, naturally deducible from the premises already laid down.

First of all, it is indispensably necessary, as a preliminary step to success, that land about to be planted should be thoroughly drained, wherever requisite, and thereby be made pervious to air and water. This is of paramount importance, more particularly to the healthy development of *larch*. Spruce, though it appears to prefer a moist soil, should never be allowed to have stagnant water about its roots. Assuming that this operation shall have been efficiently performed previous to planting, the next thing in order of importance is to make a selection of good sound plants, of the various sorts, having special regard to have each sort planted in *soil* and *site* adapted to its nature; larch never doing well in a cold, close-bottomed, and therefore impervious subsoil, nor in a very exposed situation. Here I would urge the perusal of that section in "The Forester," by Mr Brown, headed "Cause of Disease among Larch Plantations,"—a section which is both instructive and suggestive, and anticipates everything *I would* or *could* say relative to soil and site. Spruce is a gross feeder, and requires a strong and somewhat moist soil, pervious to air and water, the latter to percolate freely about the roots of the plant, but not to become stagnant, with a warm exposure. These conditions being implemented, nothing further is required till the *first thinning*, the proper time to do which depends on circumstances; but it will be better to anticipate the proper time than be behind—say at eight or ten years, as the case may be.

After the first thinning, conifers should stand free of each other, so as to admit light and air all around them; it being of the utmost importance that they should retain their foliage for the first thirty years of their existence. As this is the time of rapid growth,—the time, in short, in which to lay a *matured and consolidated foundation whereon to buildm ore wood*,—I would impress upon arboriculturists the paramount necessity of attending to this; and, instead of periodical thinnings at the end of every five years, I would advise almost a yearly supervision, where at all practicable, utterly disregarding the sordid consideration as to whether the thinnings be of *use* or not; the future welfare and ultimate pecuniary value of the plantation being kept steadily in view.

Thus we shall have trees grown in accordance with the principles vegetable physiology unfolds; and I am sanguine enough to believe that in consequence *dry-rot* shall, in a great measure, become a thing of the past.

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IV.—*On Pruning Forest Trees.* By ROBERT PHILIP, Forester to John I. Chalmers, Esq. of Aldbar.

OF all the departments of practical forestry, pruning may be said to hold the pre-eminence, as regards the diversity of opinion prevalent among practical men regarding the best mode of performing it with benefit to the trees. Nor do we find anything like unanimity among those authors, dead or living, who have written on the subject. But certain are we, that there have been several systems promulgated to the world, which, had they been carefully carried into execution by those in charge of plantations, would have done much more for the rearing of good timber-trees than appears to have been effected by utter neglect on the one hand, or, on the other, the barbarous practice of those who, perhaps, little thought that the subject they operated upon belonged to living nature, and was therefore subject to decay and death, which in their ignorance they were hastening on in no inconsiderable degree. So little attention appears to have been paid to pruning of late, that we find very few plantations formed within the last fifty years which give proof of the operation having been attended to in any degree, or on any principle whatever. Hence the many dwarf, ill-shaped, unprofitable trees to be met with in our woods and plantations.

In the few remarks which I purpose to lay before the meeting as a foundation for discussion on this important branch of forestry, I must confine myself to the most important practical questions involved in it, throwing out a few hints as to the system I have myself adopted for the last fifteen years with beneficial results to the trees.

Pruning may be, and is by some parties asserted to be, not only useless, but injurious to the trees. Several queries were lately put to a considerable number of men, who were considered competent judges, as to whether pruning was necessary or not for the production of naval timber, and all the answers returned (if we mistake not) were, that it was unnecessary, and in many cases positively injurious. But before we can place any dependence on the judgment of these parties, two things are absolutely necessary to be known:—*First*, Are they parties who are likely from their practice and observation to be considered competent to decide on so important a practical question? and, *Second*, What system of pruning had been adopted and practised on the trees from which they drew their deductions. These gentlemen consisted, for the most part, of surveyors, hewers, land-agents, converters, and timber-merchants; but the system of pruning adopted, and which they condemned, is not stated, farther than referring to the removal of large branches. One of these gentlemen states, that "the trees

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should stand so close as to cause them to make rapid growth, and at the same time to drop their lower boughs from time to time;" and "for the removal of these branches no mechanical means are necessary, nor should any be resorted to under any circumstances. The sapwood, as it is formed gradually, tightens round the base of the dying bough, until the branch is quite rotten, and drops off when the sapwood extends its growth over the place; and so perfect is the process by which the dead bough thus leaves the parent stem, that no appearance, either externally or internally, remains of a bough ever having grown upon the bole of the tree; but if the dead branches are removed by cutting, their base becomes rapidly covered with sapwood, and the tree will be permanently defective. In the second stage of growing timber the process is much the same: the bough being larger, the decay is more gradual; but if the dying boughs are left entirely to themselves, they will drop off without injury to the trees, and, with few exceptions, without leaving a trace in the bole."

Now, if a plantation be kept in so close a condition as to cause the trees to run up at a rapid rate, leaving the branches to die and fall off the bole, I maintain that these branches will be diverted from the normal angle on which they naturally spring from the bole of the tree, and caused to rise much more perpendicularly; and if so, when they die, the sapwood, instead of covering over the base and leaving no blemish in the timber, will form a cup-like protuberance at the same angle as the branch grew, and when it (the branch) falls off, it leaves a concavity, which fills with every shower of rain that falls; and, in the case of the ash and elm in particular, the water thus collected and retained finds its way into the very heart of the tree, causing discoloration and decay for a considerable distance.

But a modification of this principle I have found to be the best system of rearing clean timber: that is, to keep the plantation in a pretty close state till the desired height of stem is reached. This forces the sap to the top of the tree, and if the sap is kept flowing steadily to the leading shoot, the tree will gradually increase in height, leaving the side-branches comparatively slender below; the great desideratum in rearing clean timber being to keep the side-branches from increasing in thickness at the base till such time as they require to be dispensed with as useless to the healthy development of the tree. However, I have said a modification of growing plantations—hardwood ones I mean—in a close state is necessary. If we allow the trees to stand so close as to draw them up like poles, there are but a very few branches at their tops; and in many soils it becomes impossible ever after to thin them properly out with the view of growing heavy timber: besides, very much growth is lost, which might have been appropriated to increasing the bole of the tree in diameter. To obviate the difficulty of overdrawing

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the trees, pruning becomes necessary. After the trees are planted, it becomes necessary to prune them, in order to keep the branches from gaining undue proportions 'till the trees are close enough together to shelter each other, and produce the effect I have described.

My own practice is, to prune all hardwood trees as soon after planting out as they give evidence of having established themselves properly in the soil. This pruning is nothing more than merely shortening the strong branches in order to check their growth; and I would observe here, that many people who prune on this principle cut these strong branches too far in, which increases the very evil it is intended to prevent; for, if they are cut in near to the stem, they push out several strong vigorous shoots, which tend to increase the *stump* at the base, and form the tree into a perfect conical bush. This must be studiously avoided at all stages of the tree's growth, as increase in size does not depend so much upon the quantity of branches as upon the extent of strong healthy foliage. By keeping the branches on a young tree from increasing in thickness at the base, and at the same time of proportionate length, we have the greatest expanse of leafage exposed to the atmosphere for the inhalation of the gaseous nutriment which the tree derives from that element, as also for the elaboration of the juices extracted from the soil; and, consequently, the tree in the most favourable circumstances in which the art of man can place it in reference to training.

I continue to look over the plantations annually, for the purpose of pruning where required, till the trees are perhaps fifteen years old: then they may be pruned every alternate season till they are thirty years established in the plantation. Few branches are cut from the base of the tree till it is 12 to 15 feet high; then close pruning commences. It is of the first importance in removing the branches from the tree, to see that it is in perfect health, and supplied with a large proportion of top; otherwise the tree will not cover over the wounds caused by the removal of branches, till these wounds have begun to decay; and this deteriorates the value of the timber for any purpose when cut up for use. Nor should many branches be removed at one operation, else the tree receives too great a check, which also hinders the healing of the wounds, a large number of which to heal at one time lays too heavy a tax upon the healing powers of the tree. Before removing the lower branches, they are shortened in considerably a year or two previously, which has the effect of completely stunting them in their growth, and they are now prevented from pushing out strong shoots by the overshadowing of the longer branches above them. This process is carried on, of keeping in all contending branches, dwarfing the growth of the lower ones previous to removal, and gradually clearing the stem till the de-

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sired height is attained; and by this method the branches are kept of such a size that the wounds caused by their removal readily heal over, while the tree has the advantage of a large expansion of leafage, which increases the circumference of stem in proportion to its height. From the commencement of pruning, I pay particular attention to the leading shoot, always keeping the tree to one straight leader if possible; and I may state that, if the leading shoot of any tree is kept ascending in a satisfactory manner, the sap naturally ascends to it, and thus the branches have a less tendency to ramble out to undue proportions, requiring also much less of the pruner's assistance.

The season of the year which I have found best suited to pruning operations is from the middle of March to the end of April, and immediately after the bark ceases to run with the barker. When pruning is performed in the early months of winter, the wounds get dried up, and the bark around their edges separates from the wood to a certain extent; and the same thing happens if close pruning is performed while the bark runs freely—from the first of May to the end of June. But it seldom happens that we are so well supplied with pruners, if there is much work of this nature to perform, as to be able to overtake the whole during these periods; still I am satisfied the nearer we can keep to them the better. It is unnecessary to state to a society of practical men, that the neater and cleaner the cuts made in close pruning, the better will these wounds heal over. However, a diversity of opinion exists as to the size of a wound which will heal over without damage to the timber of the bole. This, in my opinion, very much depends upon the health of the tree, and the proportion the branch removed bears to the main stem, and also on the rapid progress of the tree. At all events, I am quite certain, from the rapid growth of the oak in Perthshire compared with its slower progress in this and eastern counties—a few of the very best soils and situations excepted—that a tree in the former will cover over a wound 3 inches diameter, as soon as a tree in the latter places will cover over one 1½ inch.

When the tree arrives at the proper height of stem, and the top is about to be formed, great care should be exercised in directing the principal limbs, seeing that they start off from the main stem at proper angles. This is of the utmost importance where heavy timber is the object; for how often have we to complain of heavy limbs being torn from the trees by severe gales of wind, and often they split down and render the tree comparatively useless. This arises from the branches being allowed to fork or go off at very sharp angles from the main stem, which always form insecure joints, and is most common to the beech.

Hitherto I have said nothing about pruning ornamental trees, and those which have been long neglected. In reference to the

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former, all that is necessary is, to keep any strong branches from running out to undue length, and thus destroying the normal shape of the tree, of whatever species, and attending to the direction of the branches in forming secure joints with the main stem. Nothing can be more barbarous than the practice of endeavouring to destroy the natural habit of growth of an ornamental tree by pruning it into any fanciful shape. The nearer it can be kept to its natural habit the better. According to some authorities, that habit can be ascertained by an examination of the foliage, though, in such a judgment, room must be made for many exceptions. Neglected trees are the most difficult of all to operate upon without damage to their growth or timber; and if pruning be carried to any extent on these, it certainly renders them pitiful objects to look at, with very doubtful results as to their ultimate improvement. If trees have arrived at anything like timber dimensions, having strong limbs running out from the main stem—it may be nearly equal in size to the main stem itself—close pruning is sure to destroy the quality of the timber, and, to a certain extent, retard the growth of the tree, if many of these large branches are cut clean away. In dealing with old neglected trees, we often find that from neglect of proper thinning, or from death among the trees themselves, many of them have strong, ill-placed boughs upon them, which, coming off at the sharp angle I have already adverted to, are very liable to be torn off, to the great disfiguration of the tree, and also to the deterioration of the timber—often the entire destruction of many fine trees which can ill be spared. I consider that when we come to deal with such ill-treated subjects, the best method is, after the trees are thinned out amongst themselves, to go carefully over them, shortening in any of those boughs which there is a danger of being so torn off by high winds, and cutting off all dead wood. But let it be borne in mind that this shortening must have reference to balancing the top of the tree only; for if anything farther is attempted, ten to one the plantation is ruined for ever. Let us endeavour to *assist* Nature, but not to *control* her, under such unfavourable circumstances.

Hedgerow trees are frequently allowed to spread out to an undue extent for their height, and to encumber the fields they may divide or surround. To deal properly with such becomes the most difficult part of the forester's duty, requiring great skill and judgment. It is quite easy to clear the fields of such encumbrance, but the difficulty lies in doing so to a reasonable extent, and without rendering the timber of the main stems useless, except for firewood,—also very disagreeable to look upon for many years. Let it be ever borne in mind, that where hedgerow trees are planted, it is for a threefold purpose—ornament, shelter, and utility—and the happiest combination of these always constitutes the best hedgerow; but let it also be borne in mind, that a rea-

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sonable space is required for the spread of the branches, and to confine them, as we would do in a close plantation, where timber alone is the principal object aimed at, is not only to entail a great amount of labour on the pruner, but to defeat the purpose of the planter, and the natural laws which govern the growth of trees so circumstanced.

In dealing with neglected hedgerow trees, I invariably shorten in the principal strong branches in such a manner as to bring them within the general outline of the smaller ones, always cutting them, if possible, at some healthy twig or smaller branch, and where the end of the *stump* will be best hidden by the foliage when the tree is in leaf. But I seldom cut any of the branches close in to the bole, except small ones next the bottom, or any large ones to serve some particular purpose; and thus the tree is brought within reasonable limits, without being so disfigured by the operation as to become unsightly. Besides, there is by this method a greater superficial extent of leafage preserved upon the tree to produce timber and shelter, than by the too common practice of cutting away all the lower branches for a considerable distance from the ground. The above treatment has reference to trees of a healthy, vigorous description only, which have not reached anything like maturity. After hedgerow or any other trees have reached the latter stage, the best and most profitable method of dealing with them, if they must be dealt with at all, is to cut them down and plant others; then attend to their proper training till they have acquired the desired height of bole.

It only remains for me now to refer to pruning coniferous trees; and this I must do very briefly, as I have trespassed too long on the time of this meeting already. In rearing any sort of coniferous tree, no pruning of the living branches is at all necessary or even allowable, except to keep the plant to one leading shoot till such time as the lower branches die naturally for want of light and air—perhaps the Deodara excepted. This tree, and the Cedars generally, appear to stand pruning by shortening their side-branches as well as any hardwood tree; but no close pruning of any resinous tree is beneficial, but injurious, while the branches are alive. When dead branches are lopped off while the tree is in its dormant state, no damage will ensue if the living bark be not disturbed, but this must be particularly guarded against. Perhaps the spruce is of all other resinous trees the most impatient of close pruning. I have seen the evil effects of pruning it very clearly demonstrated after the tree was cut up for use; but I have many specimens of Scots pine in my possession which prove the beneficial results of pruning off its dead branches. Were it not for the expense, I should recommend the pruning of every Scots pine-tree; that is, cutting clean away every branch as it dies and dries on the bole.

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V. — *On the Felling of Timber, with a View to Future Durability.* By JAMES MACNEIL, Abercairny, Crieff.*

ON putting the question, What is the best season for felling timber of various kinds, with a view to future durability? we shall seldom find the opinions entertained by any two individuals entirely to agree. This is not as it should be. Believing the satisfactory solution of this question to be one of utility, and a desideratum in arboriculture, and conceiving it to be a duty which we owe to our position as a member of the Arboricultural Society to attempt its solution, we shall now do so, even at the risk of being deemed egotistical.

First of all, then, we shall premise that the best season for felling timber, with a view to future durability, is during the months of November, December, January, February, and March; and in order to justify our adoption of this view, we shall avail ourselves of the aid which may be obtained from vegetable physiology and analogy, and in the application of our deductions (so far as we possess the commodity) use common sense.

It is necessary to our purpose, before proceeding further, that we give a summary detail of the circulation of the sap, according to the generally received belief of the most eminent physiologists. We have only to use our eyes to be in some measure cognisant of the phenomena of vegetation in timber-trees. Obedient to the call of Nature, early in spring the sap begins to ascend, and continues to rise till the leaves are fully developed, and begin to imbibe nourishment from the air. This ascending sap always flows through the soft or sap wood, and spreads horizontally as well as vertically. It furnishes the cellular tissue for the leaves, stem, and bark, and deposits the inorganic or earthy matter carried up with it in the woody fibres of the *heartwood*, which, when these are filled up, becomes *dead, and undergoes no further change till it begins to decay.* The leaves being the chief seat of the elaboration of the ascensional sap, are destined to play an important part in the economy of vegetation. The ascensional sap, on its arrival in the leaves, is divested of the superfluous air and moisture it contains; carbonic acid and other gases are absorbed by them; their organic functions are called into action, stimulated by light and heat; and a particular elaboration takes place, by which the sap is converted into what is termed the *proper juice* or food of plants. It now descends, its principal current being through the bark, though it spreads horizontally as well as vertically, assimilating, consolidating, and depositing its nutritious principles in all the *growing* parts of the vegetable structure. In

* See Report of Judges, October 1859.

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consequence of this circulation of the sap, which is the agency of growth, a new layer of alburnum is deposited annually; and at a certain age of the plant's growth a layer of the immature wood is converted into heartwood, thereafter to undergo no further change till it begins to decay. Such is a summary of the circulation of the sap, and from which the following deductions may be legitimately drawn:—

The sap being the agency of the growth and development of trees, it follows that, during the period of its annual circulation, all the tissues of the *growing* parts of trees must be surcharged with crude, diluted sap, consequently loose in texture, and therefore less fit for building purposes or future durability. If we were to use heartwood alone with these ends in view, it does not matter at what season we should fell timber in, as it is perfected, fully elaborated wood, and therefore undergoes no further change. For the same reason, if we are under the necessity of felling timber during the circulation of the sap, it would be advantageous to resort to root-cuts only, as, by so doing, we should have a greater proportion of heartwood. Abstractly considered, to fell timber, with a view to future durability, during the circulation of the sap, is analogous to placing ourselves in the position of the agriculturist who should cut down his cereal crops before maturity. Both are annual crops; for, though a layer of wood, once deposited, is, properly speaking, perennial, still it is an annual production, but requires the depositions of the sap of years before it becomes assimilated into heartwood. If we assume that the expansion or swelling of the buds indicates the ascension of the sap, and, in deciduous trees, that the autumnal tint of the leaves indicates the process of ripening, and the fall of the leaf the maturation of the crop for the season, we shall find that the period of growth, or the maturation of the crop of timber for the year, occupies from about the beginning of April till the end of October. As a general rule this holds good, though there are no doubt exceptions, much depending on the *kind* of tree, the nature of the season, the soil and aspect of the situation, the general health, and the vigour with which the organic functions operate. The outward expression of trees in winter gives the impression that this is the most fitting time to fell timber, with a view to future durability. Divested, as they are, of the organs of nutrition—those leafy appendages so necessary to vegetation—we cannot fail to see that this is a season of rest or repose, in which the vegetative functions are in a great measure suspended, to be again resuscitated by the genial influences of spring. We consider, therefore, that we are justified in what we have already premised—viz., that the best season for felling timber, with a view to future durability, is during the months of November, December, January, February, and March, as the maturation of the wood, owing to the deposi-

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tions of the ascending and descending saps, is completed for the season; the tissues are therefore more dense and consolidated, and in consequence less liable to split, warp, or rot; in short, in every respect better adapted for all purposes to which timber is applied.

We have thus given our opinion of the question at issue, not with the intention to dogmatise, but acting under the conviction that we are discharging a duty which we owe to our position as a member of the Arboricultural Society. The callous indifference evinced by the members of this Society as to the questions annually submitted to their consideration is matter of regret, if not of reprehension; for how can we reasonably expect that *forestry* is to advance either as a science or as an art without the interchange of thought, and the consequent dissemination of ideas? We shall necessarily become isolated—localised, so to speak—each one acting in accordance with the traditions or prejudices of that portion of country in which he may happen to be located, without having any fixed or authoritative rule of guidance to go by. If we have reasoned from sound premises, our deductions must necessarily be sound also; and it is our belief that it is much better to reason from the well-known laws of vegetable physiology, than to dogmatically assert, or put forth our own private opinions, which probably would be found afterwards to be either antagonistic to, or subversive of, those laws.

An opinion is generally entertained—and for that reason ought not to be ignored—that timber should be felled only during the decline of the moon; for if it should be cut during its increase, it will not be of good or durable quality. This opinion is neither local nor national, but prevails in various countries. An author of celebrity (some of whose works we have recently read) says, that it is acted upon in England, and is made the ground of legislation in France, the forest laws of the latter country interdicting the cutting of timber during the increase of the moon. The same opinion is prevalent in Brazil. It is confidently affirmed by men of eminence, that wood which is not felled at the full moon is immediately attacked by worms, and very soon becomes rotten. In the extensive forests of Germany, we learn that the same opinion is entertained, and acted upon with the most undoubting confidence in its truth. The physical cause assigned is, that the force of the sap is much greater during the increase than during the decrease of the moon; and it is hence inferred that timber which is felled in the first or second quarter of the moon, when the vessels are more filled with sap, will be spongy, and therefore more easily attacked by worms; that it will be difficult to season, and that it will warp and split by exposure to very slight variations of temperature; but that, on the contrary, timber felled in the third or fourth quarter, when the sap ascends with diminished

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force, will be more dense and durable, and fitter for the purposes of structure.

M. Duhamel, a celebrated French botanist, made direct experiments for the purpose of testing this question, and clearly and conclusively showed that the quality of timber felled in different parts of the lunar month is the same. In order to prove this, he felled a great many trees of the same age, growing from the same soil, and exposed to the same aspect, and never found any difference in the quality of the timber when he compared those which were felled in the decline of the moon with those which were felled during its increase: in general, they afforded timber of the same quality. He adds, however, that, by a circumstance which was doubtless fortuitous, a slight difference was manifested in favour of timber which had been felled between the new and full moon, contrary to popular opinion.

This result of Duhamel's experiment is exactly what we should have anticipated; and we would therefore homologate the above paragraph to the very letter. It is reasonable to do so; for it is notorious that heat is one of the chief stimulants of the circulation of the sap, and we have yet to learn that the moon is a calorific body. But admitting even that it is so, still the anomaly exists, and requires to be accounted for, how it becomes to be a stimulant to the ascent of the sap during its increase, and not during its decrease. Indeed it is a well-known fact, that in clear and cloudless nights, when the moon shines with intensity and brilliancy, owing to the rapid radiation of heat that takes place, these nights are much colder than those which are cloudy. Heat, therefore, it would seem, is not the cause.

Can there, then, be anything imagined more extraordinary, anomalous, or unaccountable, than this supposed correspondence between the movement of the sap and the phases of the moon? It has its parallel only in the belief, at one time generally entertained, that insanity was induced, or at least influenced, by the moon; hence the term *lunatic*. The primary idea attached to this word is now obsolete; for, though it is a legitimate word, and one of common use, we do not understand it to imply that the individual afflicted with insanity is influenced by the moon. But to apply the term *lunatic* to those who entertain the belief that the ascension of the sap is influenced by the moon, *in any of her phases*, is to give the word its primary signification, and to use it appropriately; as it is our opinion that they are truly, and in every sense of the word, *lunatic*.

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VI.—*Preparation of Waste Land for Planting.* By ROBERT PHILIP, Auchluncart, Keith.

The due preparation of ground for planting and rearing forest trees is a subject which has engaged the attention of many individuals during the last two hundred years or so, and hence, it may be supposed by many that there is little need for taking up time in writing further upon it. Be this as it may, the too common practice, even still, of planting forest trees without anything in the shape of duly preparing the soil for them is deemed sufficient apology to justify any practical forester of the present day in endeavouring to draw attention to the subject. Seeing that our timber trees yield considerable revenue to those proprietors who are fortunate enough to possess them in any considerable numbers, and of an age to be useful for any of the many and various purposes to which timber of all sizes is applied, it is surely not asking too much when we call on planters to look well to this department of arboriculture. This is the more necessary, as there are still too many to be found who, either from ignorance, or from a stinted niggardly expenditure, plant trees in ground where no one who understands the nature of their growth could expect them to succeed, or leave much land lying waste and worthless, just from want of a reasonable amount of preparation to render it suitable to the growth of some one or other of our useful timber trees. Without dogmatizing, we would venture to give, in the following remarks, our experience and views on this department of forestry; and, as there are several distinct operations to be performed, we shall consider them separately.

Clearing the Ground.—When ground which it is intended to plant is covered, or partly covered, by whins, broom, brambles, birches, or any other undergrowth which would interfere with the operations of draining and planting, or which would be likely to interfere with the young trees in the early stages of their growth, the first operation of the planter must be to have the whole cleared out of the way. Whins, unless when a very close crop of young growth, such as we generally find when they have been repeatedly burnt down, or such as we often find on land which has been recently under cultivation and then allowed to run waste, are not very difficult to manage. We have always found it best to grub up whins, and to leave them lying on the ground on which they grew, for at least one whole year, and if longer, so much the better. When thus treated, the decaying foliage and small twigs rot out any roots which may have been left, and cover the surface so closely, that the seeds lying on it cannot germinate for a considerable number of years, and the trees planted not only get the free and entire use of the soil, but are never liable to be choked and

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smothered by them in their early growth. After lying for the above period, all the strong stems of the whins should be collected, and if sale can be got for them, sold, or burned in heaps, and the ashes spread over the surface of the ground. But these strong whins are easiest got rid of; and it is far more difficult to keep down those of smaller and slenderer growth. To eradicate them is impossible, till such time as the crop of trees makes sufficient progress to overtop and kill them from want of light and air. If we grub them up, it is at a very considerable cost; and from the fact that the whole surface is broken up in the act, if they are a close crop, a fresh and more abundant one, from seeds lying on or in the surface-soil, will be sure to rise the very first year, which, from the stirring of the surface-soil, will either grow and luxuriate at the expense of the young trees, or will entail considerable labour and expense in keeping it down. The cheapest and best method of keeping down these young whins is to cut them as close by the surface of the ground as can be done with the whin-scythe; and, if they are not in such quantities as to impede the operations of the planter, to let them lie on the ground, attending to the clearing of the young plants—by cutting over the whins for a few years after planting—till they get the mastery. To clear the ground of strong broom is a very easy process. All that is necessary is to cut it over by the surface—by no means to pull it up by the root, which breaks the surface, and lets up a new and closer crop. Smaller broom requires to be treated in the same way as young whins. Brambles, raspberries, or other slender undergrowth, can all be cut close to the surface with the whin-scythe, collected and burnt on the spot. Birches and hazels require to be cut down to the surface of the ground, grubbing them up being too expensive. It sometimes happens that straggling Scots firs, larches, or other species of fir trees, are scattered here and there over the ground. If any of the fir tribe occur, they require to be grubbed up by the root. We have universally found that cutting down such, and leaving the roots in the ground, tend to encourage those destructive beetles, weevels, and hylurgus, which have killed thousands of young trees after planting. Having thus got the ground cleared of all impediments to the other operations, the next process is to lay on the drains properly.

Draining.—To enter into the subject of draining at full length, in such a paper as this, would extend it beyond convenient limits, and hence a few general remarks must suffice. In the first place, every part of the ground not naturally dry enough for the growth of the species of tree intended to be planted, must be made so by means of properly constructed open drains, laid on to the best advantage. Nothing in the cultivation of trees can be shown to be of more importance to their future welfare than proper drainage of the soil; and no branch of arboricultural operations has been

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equally neglected. True, much of the ground occupied by a crop of timber has got something in the shape of drainage, but it scarcely deserves the name. In most instances, there are too many drains where the soil is very wet, but these drains are by far too shallow to be of much service in drying it; besides, they so cut up the surface, and thus deprive the trees of sufficient space for the full development of their roots, that they are unable to fix themselves securely in the soil, and are thus also deprived of sufficient nourishment to bring them to good dimensions. This arises from the fact, that they can neither extend far laterally, nor strike deep into the soil, where the surface is cut up into twelve or eighteen feet strips by *sheughs*—for they can be termed nothing else—about a foot deep. If draining is to have any effect in drying the soil; that is, if the soil be of such a nature as can be in any way improved by means of these shallow drains, four, five, or six yards apart, it will be found an improvement to lay them on at seven, eight, or ten yards apart, and from twenty-two to thirty inches deep, according to the species of tree to be planted, and the nature of the soil to be drained. Another point to be observed in draining is, that ground which lies pretty level requires more drainage to lay it sufficiently dry for our purpose than ground of considerable incline; for it is not so much the quantity of dampness or water in the soil during the rainy periods of the year, as of water standing stagnant about the roots at all times, which does the mischief. For example, we have seen fine, heavy sound timber on very damp land, which lay on a considerable incline; while, on the other hand, we have seen very inferior trees on the very same quality of soil on a flat surface. Nor do all kinds of trees require equally dry soil. According to their natures, the firs would seem to occupy the following order—viz., beginning with the spruce in the dampest soils, then the Scots pine, and lastly, the larch. The silver fir seems to adapt itself to various qualities of soil, and also in various degrees of dampness, but will thrive and reach good dimensions on such dry soils as will prove fatal to all the other fir tribes. The hardwood trees would seem to run in the following order, as far as mere dampness or dryness of soil is concerned: *first*, the alder, willow, and poplar; *second*, the ash and elm; and, *third*, the oak, sycamore, and beech. These being the principal forest trees cultivated for their timber, it is not necessary to notice more of them in such a paper as the present; but it is necessary to take notice of these, as, in preparing ground for planting, the first thing to settle is, what kind of tree or trees are to be reared, and then to drain accordingly. The quality of the soil, and other circumstances, should determine the first question, and that being settled, the nature of the trees selected form a guide to the other.

In draining ground for planting, the drains should be laid on

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in such a manner as to have proper declivity or fall, to enable them to discharge themselves freely into the mains or leaders; in no case to have less than two inches per chain, and, if possible, a few inches more. The leaders should be made a few inches deeper than the ordinary drains, and put down in the lowest parts of the ground, if fall be deficient. The quantity of leaders or receivers of the water collected by the small drains must be regulated by the ground; for example, on flattish ground, small drains may run 200 yards before falling into the leader, but never more; while on ground having considerable declivity, one-half the above distance will be far enough. The geological formation in the district must be carefully observed and attended to in draining. The want of this has rendered much of what has been written on the subject worse than useless. To recommend any system as universally suitable is quite preposterous. For example, in the district from which we write, the strata all lies on a declivity to the north and east, cropping out to the surface; and to recommend that such should be drained diagonally to the lie of the strata, is just to advise people to throw away money without accomplishing their object.

The distance between the drains, and also their depth, must in all cases be regulated by the nature of the soil and subsoil, and the degree of dampness. No absolute rule for this, which will prove an infallible guide under all existing circumstances, can be laid down by any one. In concluding this part of the subject, we would impress on all who plant, the great importance of a suitable and well-regulated system of drainage where it is required.

Roads.—Another point of importance in preparing ground for planting is, to lay off roads at the most convenient distances, and in the most convenient places, which roads should be left unplanted, for facilitating inspection of the plantation at all times, and for convenience in hunting, as also thinning, when that operation commences. Where these roads run through damp or wet ground, a drain must be cut along each side, and the material dug from them thrown to the centre of the road. This helps to keep it dry and firm when the tracks or ruts made by the wheels of carts or waggons in removing wood are kept filled up. But these roads should, when at all convenient, be made on the firmest and driest parts of the ground. When the plantation is of considerable size, requiring roads for the removal of thinnings, one should be made along the outside of it, between the fence and the trees. This prevents any necessity for breaking down the fence; and if the fence is a hedge of any kind, it is never smothered with the trees, nor is the cultivated land outside the fence encumbered with them overhanging it. One particular worthy of attention in laying down roads is, to endeavour to have them run perpendicular to the drains if possible. This is of great advantage when

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thinnings have to be either carried or dragged to them, for crossing a drain at every eight or ten yards with a tree on one's shoulder is much harder work than walking along on level ground between the drains, and when the trees require to be dragged out with horses, the drains either entirely obstruct the operation, or are themselves very much damaged by it.

In high-lying districts, and where it is desirable to have the whole plantation appear one entire, unbroken mass, the roads should be made of serpentine form, in order to keep the plantation from being broken in upon by storms of wind; but in no case should any sharp turns be made in a wood road; for carters are proverbial for carelessness, and they will be sure to destroy many of the trees wherever a sharp turn occurs. Roads should be also of sufficient width to allow two carts to pass each other, and to permit of shifting the tracks of the wheels, which last makes them easier kept in repair at all times. Such roads require no further making on even surface than merely to be formed, except where any very soft places occur in the line, and all such must be rendered passable by means of harder material. When the road may have to run along the side of a hill, or rising ground, it should be cut out of the solid, and the spare material pitched over the lower side. It is needless to remark what effect good roads has upon the sale of timber, at all stages of its growth, as every experienced forester must know this as well as we do.

Fencing.—Simultaneous with draining ought to be performed the other operation—Fencing. From the fact that pasturing with sheep over the whole country, highland and lowland, has become of universal practice, the fencing of ground to be planted is rendered not only indispensable, but also expensive. Many kinds of fences are recommended as suitable for enclosing plantations, such as stone and turf dykes, hedges of various kinds, and wire and wooden palings; but as a permanent fence, nothing can equal the stone dyke, and it is to be preferred in all cases where a permanent fence is required, if material can be conveniently procured for its erection. Next to the stone dyke, as a fence, comes a good hedge, but hedges are not suitable in every case; and in preference to wooden palings and turf dykes, must be placed a good wire fence, either on iron or wooden posts. Indeed, in upland and hilly districts the wire fence is approved of in preference to any other kind of palings. We confess to having been rather sceptical to its utility at one time, from the fear of trees being either thrown down upon it by storms of wind, or by accident when thinning, but if the outsides of the plantation are kept in a proper state of openness to allow the trees to remain clothed with branches to the ground, and consequently well rooted, there will be little fear of the former evil, and care can easily be had when thinning within its reach, to prevent the latter. Where stones cannot be

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easily procured for the erection of a dyke, and in those exposed places, where the soil is often unsuitable for the growth of a good hedge, nothing else will be found so suitable as the wire fence. A ditch and turf dyke, with either a paling or hedge of whins on the top, will certainly protect the plantation against the inroads of cattle and sheep for a time; but if the paling is used, the fence is only temporary, and if the whin hedge be used, there is one very serious objection to such a fence, namely, that it becomes a perfect harbour for rabbits, which infest the whole country to such an extent that it is next to impossible to get up young plantations. The common wooden paling is the most temporary of all fences, and should never be resorted to except where the fence is required for a limited time only; as, for example, when it is intended to throw the plantation open as pasture ground, as soon as the trees are beyond danger from cattle and sheep pasturing amongst them. Where such is the intention of the planter, a good, strong, well-erected larch paling will answer the purpose, with a little repairs occasionally. We must confess that no kind of fence appears more natural for the inclosure of plantations than a good hedge, and certainly nothing looks so well if it is healthy and will kept; but if sheep get access to it, it is often rendered a very imperfect fence. This fact is worthy the consideration of all intrusted with the fencing of plantation ground; for we have felt the baneful effects of sheep on hedges to such extent as to raise the doubt whether it is possible to keep them in such condition as to merit the name of fences, where sheep get access to rub and browse upon them.

There appears to be something either poisonous, or positively injurious, in the very touch of a sheep, so that hedges cannot thrive where they get access to them. Openings below very soon occur, the sheep press through them, and once made in this way, these openings never afterwards fill up to make the hedge a sufficient fence. Hares and rabbits, where numerous, assist greatly in making openings below in hedges, which induces sheep to press through, and thus increase the evil. However, be the kind of fence what it may, let it be a sufficient protection to the plantation as long as it requires it.

Trenching, Ploughing, &c.—Some parties strongly recommend that all ground to be planted should be first trenched or ploughed. Our experience on this point has led us to the following conclusions.—Where the immediate effects of a plantation is desired at the shortest possible period from the time of planting, let the ground by all means be trenched; but, if trenched at all, let the depth be at least two feet. If the subsoil is bad, let it be only well stirred and loosened, but not brought to the surface. When it is well broken up, the effects of air and water will, in course of time, purify and render it much improved for the growth of plants. Mere scratching on the surface, as the most of trenching is, is of

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little benefit to the growth of trees. Indeed, it, on the contrary, appears to be injurious in many instances; for although they appear to thrive for a time after planting, whenever the roots reach the hard subsoil they receive a great check, and this subsoil they reach much sooner in trenched ground than when planted on the natural surface. Another objection to planting trees on shallow trenched ground is, that they don't get their roots extended downwards to sufficient depth to fix themselves firmly in the soil. Hence they are blown about by wind, and many of them made to grow in a bent manner. This, every one who has planted on trenched ground, or on very loose soil which had been cultivated, must have observed. Trenching ground for the cultivation of forest trees is limited to a very considerable extent by several obvious causes. It is impracticable to any extent, on the score of expense, for we hold that trenching will not so improve the growth and quality of timber over that planted on the natural surface as to pay the extra expense. It is only throwing away money to trench ground of fair quality of soil and subsoil, for such is perfectly capable of producing timber of good dimensions, so far as soil and subsoil is concerned, without trenching. It is positively injurious to the quality of the timber of the Scots pine to trench soil suitable for that species of tree, and this must be obvious to every one who has observed the growth and quality of the Scots pine in rich loose soil. Other species of trees do not appear to suffer so much in the quality of their timber from growing in trenched ground as the Scots pine, but it, at least, appears to require a firm soil to grow in. In moorish districts there are often patches of soil which would be much improved by being either trenched or broken up to the depth of two feet, or, at least, to such a depth as would let the roots of the trees penetrate to the softer and often better subsoil. We often meet with patches of greater or less extent in our moors where there is a hard tilly pan, or perhaps, even worse, a muirband pan, which the root of no tree can penetrate. This pan is found at various depths from the surface, and of various thickness. If it be not broken up in some manner, so as to allow the air and water to act upon it, it will prevent not only the roots from reaching the better subsoil below it, but will itself remain unfit for the nourishment of any vegetable substance whatever. The general opinion expressed regarding such soils is, that the wrong side is uppermost, and there is much truth in the remark. Where such a pan lies near the surface, it can be broken up by means of the foot-pick, or by deep ploughing and subsoiling, but if lying too deep to be broken up by these means, and where a close crop of trees is desired, as also the improvement of the soil for other purposes, nothing short of deep trenching will effect the object. We by no means assert that the crop of timber reared by such expensive processes

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will repay the outlay, but there are other considerations to be taken into account in going into such a species of improvement. If such patches of ground, unfit for the growth of trees of any kind, are left unimproved when th eplantation is formed, they will remain in pretty much the same condition for generations to come; and when the full crop of timber is cut down, these parts will have paid literally nothing in the shape of rent; whereas, if they had been properly trenched and drained at the time of planting, the herbage would have been improved as pasture, there would be something of a crop of trees upon them which would both pay something in the shape of rent and greatly assist in the natural processes of improving the soil. Should it be found desirable to convert the woodland into arable land after the crop of trees is cut down, the expense of preparing these barren patches in the manner indicated above will not be thrown away. Hard gravel is much improved for the growth of trees by the same process.

It may not be out of place to notice, in such a paper as this, the necessity of either trenching, ploughing, and subsoiling, or deep ploughing, land which has been under cultivation for any length of time, if we wish to plant such. The manner of cultivating arable land renders this necessary; for it is too often stirred to the depth of six or seven inches only, some of it to even a less depth, and the plough leaves a sort of pan or crust deeply impregnated with iron, and hardened and compressed together by the treading of the horses' feet and the action of the plough repeatedly passing over it. Its hardness and sterility are doubtless increased by the fact that water is prevented from freely passing through it to carry off the iron left by the wearing of the plough and other implements of husdandry. The roots of scarcely any tree will penetrate such a substance, and hence, having but a few inches of surface soil to grow in, they may thrive and luxuriate for a time, but will assuredly get unhealthy at an early stage, and many of them either die out or be thrown down by the wind. This fact we have noted in nine cases out of ten where trees have been planted on cultivated ground, especially on thin light soils where the subsoil, was of a rather compact nature.

Some parties advocate—foolishly we think—the manuring of ground for the growth of timber trees. No such assistance is at all necessary, or even advantageous, to the growth of trees and the quality of their timber. Where land is trenched or ploughed, either out of waste, or where it had been previously under the bad tillage to which we have referred, the addition of manure and the taking of a crop or two of some root or cereal will very much improve it, and render it in more convenient condition for planting; but beyond this no manuring of the soil is at all to be recommended.

Pitting.—When hardwood, and those of large size, even of the fir species, are to be planted, it becomes necessary to make pits

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for them. These pits should be wide enough to admit of all the roots of the plant being spread out to their full extent without doubling any of them; and as a rule, the harder and poorer the soil, the greater width of pit is required. The depth must also be regulated by the roots of the plant; but it is always preferable to have ample width in preference to great depth, especially where the subsoil is inferior. In such cases it is advisable to have the pits considerably wider than the spread of the roots, in order that they may have soft open soil in which to strike fresh root after transplanting. Our own method is, to have the pits made not less than eighteen inches wide, and even up to thirty inches in some instances. There is no practice more to be condemned than the too common method of making the pits just wide enough to admit of a man turning his foot in them, and then to have the whole roots of the plant doubled and twisted into them. Such plants can never do well till they push out fresh lateral roots in a natural direction; and if the soil be hard, the chance is, these plants never grow at all. Another important point in making pits is, to have them dug at least perpendicular down in the sides. When they are dug in the shape of hollow inverted cones, the roots have no free space in which to strike out afresh, nor is there even room to spread them out straight, and in their natural position. If pitting is found necessary, let it be well done, as it is of great benefit to the plants when they most need assistance and encouragement, viz., when transplanted from our nurseries, which are generally better soil than that to which we transfer them. Pits for firs too large for inserting in the soil, on the notching system, need not be so expensively made as those for hardwood. We generally have these prepared in the following manner:—The surface turf is pared off as thin as possible, say twelve to fifteen inches diameter, and then the soil is broken up with the foot-pick, if hard; but if soft enough to be dug up with the spade, it is dug up with it, and broken fine enough for covering the roots of the plants; but the soil is not turned out as in the case of larger pits for hardwood. When the planter comes to perform the operation of inserting the plants, he requires only to lift a spadeful or two of the loose soil to cover the roots.

Draining and pitting should, when at all possible, be all done by the month of August previous to planting, whether that takes place in the autumn or spring. Our own best success has been when these operations were finished in August, and the plants put in the following spring. By this leisurely method of going to work, the drains have time to act in drying the soil, and the material dug from the pits is much improved by exposure to the action of the weather.

Perhaps some reader of this paper may consider the method of preparing the soil for planting, as detailed and recommended

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above, too expensive, and hence impracticable; but to such a one we would say, that what is worth doing at all, is surely worth doing to the best advantage. Certain it is, that many hundreds of pounds are lost to most of the extensive properties in the country, just from want of a few pounds expenditure in properly preparing the ground for the growth of our timber trees. And there are, perhaps, also some who would prefer a detailed statement of the cost of the different operations in preparing ground for planting, as here recommended. The differences of the prices of labour in the different counties, and also at different times; the different kinds of fences employed, and the various forms of the ground to be fenced, as well as the various quantities enclosed; the amount of drainage required, the kind of drains found necessary, and the nature of the soil to be dried; the quantity and size of the pits, and the nature of the soil in which they are made; the extent of surface covered with rubbish requiring to be cleared off, and the nature of that rubbish; the extent of trenching, ploughing, or otherwise breaking up the soil, &c., all affect the cost per acre. And it may easily be understood how difficult it is, without the assistance of numerous tables, to give anything like a correct statement of what such a method of preparing the ground should cost. But, nevertheless, there is no extravagant expenditure here recommended, nor anything which we have not proved to be absolutely necessary under certain circumstances. And proprietors wishing to have them carried out, can and ought to have a correct estimate of the whole laid before them previous to commencing operations. This estimate can always be easiest arrived at on the spot, and by those conversant with the prices of labour in the district. Therefore, the want of such tables of expense can be no objection to carrying the different operations into execution where necessary, by any spirited improver of arboriculture; nor will any one be misled by our calculations, as each must satisfy himself as to the actual cost on his own property. But if the adjudicators of this paper consider tables of expense of any practical value for publication, they can be furnished by the author.

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VII.—*Remarks on Mr M'Intosh's work on the Disease of the Larch.*

This is a small work, 12mo, pp. 136, published by W. Blackwood and Sons, on one of the most important points in the cultivation of the larch. The author's title to be heard on the question must be undisputed, when he tells us that his experience reaches over the long period of half a century. Long as this period is, and extensive as is the field of observation,—extending to "Scotland and England," and over "most soils and most situations,"—our author does not confine himself to his own observation and experience. He divides his subject in the following order, viz., an Introductory chapter; nine chapters on—

1*st*, "Total neglect in procuring seed from healthy and fully developed trees.

2*d*, "Planting on soils and in situations unsuited to the nature of the trees.

3*d*, "Want of sufficient drainage in water-logged land.

4*th*, "Too thick planting, neglect of thinning, and injudicious pruning.

5*th*, "Planting in ground on which a previous crop of larch, Scots fir, or other coniferous trees, has been grown.

6*th*, "Planting young trees in rich soils in nurseries, with a view to their attaining a large size within the least possible time.

7*th*, "The attacks of game, and the browsing of cattle and sheep.

8*th*, "The period at which the disease attacks them.

9*th*, "The accidental misfortunes they are liable to, such as the attacks of insects, parasitic fungi, late spring frosts, diseases in the bark, dying away of the branches, &c. &c.;" and

An Appendix containing seventeen queries to his arboricultural friends regarding the present state of larch plantations, with the most important of the answers given.

In the introductory chapter, Mr M'Intosh states that the larch is, "in the majority of instances, in this country, in a state of decay," and speaks of "its ultimate extinction." He acknowledges that, "after the most careful investigation, the action of the causes of the disease, in many cases, remains very obscure; and hence the great variety of opinions that have been advanced on the subject." Not confining himself to his "own individual opinion," he has "condensed those of above fifty highly respectable authorities." Thus the work possesses a value to which the recorded observations and opinions of no one individual can lay claim; for here we have collected together, in addition to the opinions of the author, those of the greater portion of writers on the subject. By foresters, whose means will not permit of purchasing all the books and periodicals in which those observations

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and opinions are recorded, and by gentlemen, whose time will not permit of searching through many volumes for the information contained in this little book, the author's effort must be at least approved of.

Reference is made in this chapter to the existing opinion "that the larch, not being a tree indigenous to Britain, is degenerating in consequence of change of climate;" but the author considers, that where it has been raised from healthy seed, and placed in favourable circumstances, there is a probability it may reach the natural period of its existence, which Willdenow states to be from 150 to 200 years. Parkinson and Miller are here quoted to prove the time when, and the place where, the first larches introduced into this country were grown, and that the earliest supply of larches were reared from those few trees grown in the rich soils of London nurseries and gardens. Hence, Mr M'Intosh questions whether their cultivation was not started on a false principle, namely, gathering the seed from those few trees grown in the rich soil and murky atmosphere of London nurseries, a transition from their alpine habitats sufficient to produce a considerable effect on their constitution. We have in this chapter some interesting statistics regarding the introduction of the larch into our forests as a timber tree, and the numbers planted during the latter half of last century. This, so far as ascertained, he puts down at 28,000,000, and then asks, Have we fifty of these trees in a living state at the end of only one hundred years? From this fact he assumes that the larch "has not hitherto shown itself a long-lived tree in this country." From what of his own opinions already stated, and from what will follow as we proceed, little wonder will be excited at this; and when we bear in mind that the larch reaches it highest value as a crop, even on the best soils on which it is planted in this country, at an age considerably under one hundred years, it is but few trees which we may expect to find growing at that age. Mr M'Intosh has already admitted that, when the trees are raised from healthy seed, and placed in favourable circumstances, there is a probability that they may reach twice the above age. But except a few ornamental specimens, who can afford to let the crop stand till it reaches this patriarchal age?

Some remarks on the value of the larch follow, and it is stated that "there are purposes for which it can never be put on an equality with English oak, ... or Baltic pine;" and when it is used "in house-building," it "should be of from fifty to one hundred years' growth." Mr M'Intosh admits the usefulness of the larch, but remarks that too much reliance is placed upon it "under its present treatment and condition; . . . . and that if its cultivation is continued to the extent it is, the consequences to landed proprietors will be most disastrous." He notices the first experiments with the larch in ship-building, but states its unsuit-

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ableness for this purpose; and after referring to "the praiseworthy example of the Duke of Athol in planting so many thousand acres" of larch, he says, "Our hopes are, however, now blighted," and "the loss, therefore, to landed proprietors, particularly those having large tracts of land unfit for almost any other purpose than the growth of wood, is incalculably great;" all this loss arising, of course, from the diseased state in which the tree is found all over the country, and not from its unsuitableness for mere naval purposes.

This introductory chapter concludes with the following: "That the decay in the health of the larch, in whatever form it may appear, has not arisen from any natural change in the constitution of the tree itself, as asserted by some, is a fact borne out by physiological science; its present debilitated and unhealthy condition is owing to mismanagement. Our present object is to endeavour to determine in what this mismanagement consists." We shall now notice the nine chapters of this work in detail.

1*st*, "*Total neglect in procuring seed from healthy and fully-developed trees.*"—We are perfectly aware that many foresters and nurserymen pay but little attention to the selection of seed from our forest trees, and Mr M'Intosh gives a very good reason for the fact, viz., "the rage now-a-days for cheap forest trees, and cheap planting by contract." He states in this chapter, that "so long as seedling larch are sold at from 1s. 3d. to 1s. 6d. per 1000, and two years' transplanted at 15s., no great hope can be entertained that much attention will be paid to procuring genuine seed. Such prices would not pay; nor is it to be supposed that any sane nurseryman will become so patriotic as to go to the expense and trouble of procuring better seed than the present without adequate remuneration." Healthy seed, we are told, can only be procured at greatly increased cost, and consequently the plants must be charged higher. Mr M'Intosh's estimate of the prices which would pay the nurseryman for bestowing the requisite trouble and expense of procuring seed from those few old healthy trees which exist in the country, may be gathered from the worth, to proprietors, of plants raised from such seed, which he puts down at three times present prices. He tells us that "Cheap trees and a healthy stock are things quite incompatible."

Reference is made to the "pretty prevalent opinion that larch seed from the Tyrol is exempt from disease," but that this is "a fallacy," and that "trees raised from Tryolese seed are more liable to suffer from our late spring frosts, which is one of the causes of disease, than those raised from seed of native growth." Quite the contrary of this is asserted in a report to the "Highland and Agricultural Society of Scotland," No. 68, p. 280, where the reporter states that "the Tyrolese larch, though planted on the most exposed situation of the hill,—a north and north-east

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exposure, and at an elevation of 1000 to 1400 feet above the level of the sea,—has completely outstripped the common larch in the rapidity of its growth and in the healthy appearance of its foliage."

A very good suggestion is thrown out in this chapter, which, if foresters would act upon it, would tend to improve the health of the larch grown from native seed, viz.: "As the larch, when of large size, is generally felled during winter, at which time the seed is ripe, a considerable supply of good seed may be very conveniently procured when the trees are down, as at that time their healthy or unhealthy state can be more readily ascertained than while they are still growing." Regarding the necessity of procuring healthy seed, the opinions of Dr Lindley, the late M. de Candolle, Brown, Sang, and Grigor are quoted; and then the varieties—which botanists identify as nine in number—are treated of, only three of which, *L. communis*, *L. laxa*, *and L. flora-rubra*, are recommended as proper to gather seed from as forest trees.

This chapter concludes with some remarks on the effects of climate on the larch, and reference is made to the comparative growth of the *Pinus pinea*, the *Pinus Strobus*, *Larix americana*, the *Abies canadensis*, and the *Picea balsamea* in this country, and in their native habitats.

2d, "*Planting the Larch on soils and in situations unsuited to its nature.*"—Our author considers the choice of soil and situation next of importance to having plants reared from healthy seed; and, like most other writers on the larch, he complains of these matters having been hitherto overlooked by planters. He affirms the assertion in the *Arboretum Britannicum* to be "most erroneously stated, that the larch will grow at an altitude of 1800 feet, while it limits the Scots fir to 900 feet. Had this order been reversed, it would have been much nearer the truth." He states that the "best larch timber hitherto produced in Britain has been grown under 500 feet above the sea;" in support of which fact, he instances those of Mr Grant of Glenmoriston, elevated only from 12 to 30 feet above tidal mark; the fine old specimens at Dunkeld, standing 130 feet above the level of the sea; and the largest at Monzie and Craigdarroch, at about the same altitude; those at Ballindalloch about 400 feet; and at Monymusk 340 feet above the level of the sea; and many others all ranging under 500 feet above the sea-level in this country. The fine larches in many of the forests abroad are also given as examples of the range of altitude at which the tree is found to reach its greatest dimensions, and the largest are always found growing at trifling heights above the sea-level.

In this chapter we have a long list of authorities quoted on the soil and conditions of soil necessary for the production of sound healthy larch-timber. Mr M'Intosh remarks, "Of one thing we

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are certain, that the larch will not prosper on soils *constantly saturated* with wet, or in those abounding in oxide of iron; while such as are incumbent on the primitive geological formations are those upon which it is found to be most successfully grown," and "in comparatively sheltered and not in very exposed localities." It also appears, from the numerous opinions quoted in this chapter, that the larch grows best on the slopes of hills where it has a free supply of moisture passing through, but not stagnating in the soil, and where it enjoys a purer atmosphere and freer circulation of air among its branches than on flat surfaces. We think too little notice is generally taken of the circumstance mentioned in this chapter, that larches grown on the north and north-eastern slopes of hills are generally the finest and freest from disease. Not, certainly, that this is invariably the case; for, on the property from which we write, there is a plantation on ground with a considerable declivity to the north, on part of which the larches are all decayed at the centre, while on part of the same slope they are invariably sound in their timber. But in this case there is a great difference of soil, which probably accounts for the fact. Where the trees are decayed, the soil is a dry light loam incumbent on sandstone—in many places conglomerate—at no great distance from the surface; while the sound trees grow on strong damp open clay, incumbent on sandstone too, but at considerable depth below the surface. Along this ridge of rising ground, for a number of miles, these conditions of soil alternate, and with the same results, proving that it is more the surface stratum than the substratum which has to do with the healthy development of the larch. But we must remark that on most of the northern declivities of the hills and rising grounds in this quarter, the soil is both deeper and damper generally, arising, we think, from the formation of the rocks, which all dip to north and north-east, carrying the moisture to that side of the hills. Hence, no doubt, the adaptability of such exposures, in the majority of instances, for the growth of the larch at an ordinary altitude, and when moderately sheltered by the natural form of the surrounding ground.

3d, "*Want of sufficient drainage in waterlogged land.*"—In this chapter we have quotations from some dozen writers on the degree of dampness or dryness of the soil requisite for the healthy growth of the larch. As might be expected, these opinions conflict on some points and agree pretty well on others. All appear to consider that stagnant water at the roots of the larch is injurious to its growth, but we are equally cautioned against the opposite extreme of dryness. It appears, from the experience of these writers, that heart-rot is found under very different degrees of wet and dry soils; and the conclusion at which the author arrives, putting his own experience and that of those gentlemen he

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quotes together, is, that the larch thrives best on hill sides, where its roots are liberally supplied with water during the growing period of the tree, and where the soil is dried up by the absence of the snow, when melted, or the drying up of *winter existing* springs by the time the young wood is ripening. In this chapter we have some interesting experiments on the comparative growth of the larch in wet and dry seasons, by the late Mr Archibald Gorrie, "than whom," Mr M'Intosh observes, "there was no more accurate observer in arboricultural matters."

In the concluding paragraph we are told: "Of the propriety of draining all land suspected of a damp subsoil there can be no doubt. . . . . Indeed, old trees require it more than young ones;" and that, "in nine cases out of ten," too much stagnant moisture at the roots of the larch renders them sickly.

4th, "Too thick planting, neglect of thinning, and injudicious pruning."—Under the above head we have some authorities quoted, whose opinions go to show that the larch suffers from thick planting, neglect of thinning, and from pruning; but none of them venture to give anything like the distances from each other at which the larch plants should be placed, except M. de Candolle, whom the author considers a "high authority," but who appears to contradict himself. He says, "You seem, generally, to plant them at the distance of three or four feet from each other. It is much closer than with us; and I think you would do well at least to double, or even treble, that distance." And again, a little further on, he says, "You should not, certainly, place the young and yet small larches at the distance of ten feet, but you should keep them close in their youth; then thin them gradually, so as to bring them to the distance of ten feet when twenty years old." Mr M'Intosh most cordially subscribes to this opinion; but if he understands it, it is more than we profess to do. Had M. de Candolle rested satisfied with giving only one of these pieces of advice we could have clearly comprehended his meaning; but when he first states that we should, "at least double, or even treble," the three or four feet at which we generally plant our larches, and then tells us that we should keep them "close in their youth," thinning them "gradually," so that they may only stand at ten feet apart "when twenty years old," we are completely at a loss to know what our author subscribes to. His recommendation to us is "to plant them thinner than is the present practice," and to thin our larch plantations biennially.

Pruning larches is stated to have "been found exceedingly injurious," which most assuredly is the case when branches, in a living state, are removed from the tree; but the removal of all dead branches proves beneficial to them, in so far as it admits a free circulation of air. We may remark here, however, that larches should be kept wide enough apart, while growing, to

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serve living branches on a large proportion of their whole height, and then there will be little necessity for injuring them by pruning.

5th, "Planting larch on land on which a previous crop of coniferous or other trees has been grown, and planting them along with Scots firs and deciduous trees."—In this chapter we have quotations from nine authorities; and in reference to its two divisions our author states, "The former of these"—planting larches on land which had previously borne a crop of any kind of trees—"is contrary to all good cultivation; the latter"—planting them mixed with other trees—"a matter of very considerable doubt." Most practical men are agreed, that to plant the larch as a second crop is, to say the least of it, a very doubtful practice, and in most instances proves a failure. Planting them mixed with other trees, however, can easily be proved to have no injurious effect on their growth when soil and other circumstances are favourable; but we entirely agree with the author when he says that he has "no sympathy, however, with such mixed plantations." It is seldom, if ever, that we meet with mixed plantations in the natural habitat of the different species of our forest trees; and we hold that to grow any kind of tree to its greatest degree of perfection, either for ornament or for profit, it is best to follow nature by planting each species in separate masses by itself, suiting the various kinds to the different soils, and taking into account other circumstances that affect their growth. Brown in "The Forester," and Grigor in "Morton's Cyclopædia," than whom we have no higher authorities on the cultivation of the larch, both assert that the finest specimens are found mixed among hardwood; but still we don't consider this method of cultivation the most profitable.

6th, "Preparing young trees in rich soils in nurseries, with a view to their attaining a large size within the least possible time."—Notice is taken here of the pernicious system of rushing up the larch in the rich and highly-manured soils of our public nurseries. This is one of the effects of strong competition among nurserymen to produce large healthy-looking plants—which are much run upon by a certain class of planters,—and to produce them at the lowest possible price. But nothing is more injurious to any kind of forest tree than to stimulate it beyond its natural rate of growth, previous to its being transplanted to the forest. With our author, we agree that "plants forced into a high state of cultivation in their youth are more predisposed to disease," and even death, when planted in poor soil and in exposed situations, "than such as are less artificially stimulated;" but we leave his readers to form their own judgment as to whether his physiological deductions on this head be correct or not.

7th, "The attacks of game, and the browsing of cattle and sheep."—We are told under this head, that "These, although

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not directly the cause of the prevailing rot-disease in the larch, nevertheless indirectly tend greatly to the destruction of the trees." This Mr M'Intosh establishes from the circumstances of thick planting, in order to provide for the *destruction* caused among the young trees by game, and from the too frequent practice of permitting young plantations to remain overcrowded in order to have *cover* for the game—this thick planting, and neglecting to thin in proper time, being in the author's opinion, no doubt "one of the causes of the heart-rot." The browsing of cattle and sheep, and their rubbing against the trunks of the trees, he says, "leaves a greasy matter on the bark, which, closing up the pores of respiration, is often fatal to them." The damage arising from the attacks of mice, squirrels, and black game, are also shortly noticed in this chapter, with the remedies for all these evils.

8th, "*The period at which the disease attacks the larch.*"—In this chapter we are told that "The larch, like every other tree, is liable to disease from its earliest infancy." Brown is here quoted to prove that disease in the larch is contagious; so much so, that it has been known to spread to neighbouring plantations. If this be really the case, we cannot be too careful in selecting clean healthy plants. But the disease here meant is no doubt that form accompanied with or caused by insects, which insects will assuredly spread to other plantations of the same kind of tree in the neighbourhood. We have never seen the fact proved in any other form of disease in the larch. Only one species of insect is noticed under this head as producing disease, viz. the "*Adelges laricis* of Vallot." This is the insect resembling the American blight on apple trees, which our non-entomological readers will remember is covered with a cottony-like substance, and under which is a very minute black bug. It is said to be upwards of fifty years since this insect was first observed to damage the larch; and Mr M'Intosh tells us that it "committed considerable havoc among young plantations in the south of England," and also "in Fifeshire so early as 1785." The *Adelges laricis* is, however, said to be seldom found on trees in a healthy state, but most generally on those in confined woods and in low situations; and hence, our author believes that "their presence may therefore be considered more as the effect than the cause" of disease. Be this as it may, when once trees get infested with these parasitic insects, they suffer considerably in health, just as in the case of attacks of parasitic plants. Both extract nourishment from the tree, and also obstruct the functions of life and vigorous health.

In this chapter the Rev. M. J. Berkeley is quoted as stating "another form by which disease is communicated by infection; namely, when the living roots of the larch come in contact with the dead roots of a previous crop of fir." This opinion, we are well aware, has long been entertained in certain quarters, but we

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are not at all satisfied with the proofs that have been adduced in its favour, as being perfectly conclusive. What staggers us most, is the fact that both Scots firs and larch continue to thrive and grow to large dimensions in plantations which are regularly thinned, where old decaying roots exist from the first thinning down to the time the trees arrive at maturity; and also the fact that seeds fall, grow, and produce fine trees where old roots are decaying in the soil. The reader will find in this chapter of Mr M'Intosh's work a pretty full account of Mr Berkeley's opinions of the way in which this fungoid disease is supposed to attack larches and produce heart-rot; and the subject is also discussed by the author himself at considerable length.

9th, "*The accidental misfortunes the larch is liable to.*—This is a long chapter, in which is treated the principal accidental misfortunes to which the larch is liable; such as, the attacks of insects, parasitic fungi, late spring frosts, diseases in the bark, atmospheric changes, &c. Under these divisions there is a considerable amount of interesting and useful matter; but we must content ourselves with a mere enumeration of them, as our remarks have extended far beyond our original limits, and we must leave the reader to gather up the information from the book itself. We would, however, direct attention to the following four "certain causes" of diseases of which the author says "there can be no doubt; and if these are conceded, the limits of the question become considerably narrowed."

"1*st*, We take this to be degeneracy in a large proportion of the present stock, arising from their being the offspring of diseased plants.

"2*d*, That larch will not long continue in a prosperous state when planted on the red-sandstone formation.

"3*d*, That, to attain its largest and most useful size, a clear bright atmosphere, at a moderate elevation, sloping rather than flat surface, sufficient ventilation to admit of the leaves performing their proper functions, neither too wet nor too dry a soil, are conditions essentially necessary.

"4*th*, Conditions to be avoided: Never plant larch on ground recently cleared of a crop of *any* coniferous tree; keep within reasonable limits of altitude; do not prune."

We have also an Appendix to this work, containing seventeen queries which the author put to a number of his arboricultural friends and timber merchants, regarding the present condition of the larch plantations in their respective districts, with answers from some twelve individuals scattered over the country. These answers, like the authorities in the body of the book, differ widely on some points, and agree pretty nearly on others. Indeed, taking this book from beginning to end, with its quotations from so many writings and correspondents, the mere theorist in the cultivation

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of the larch will, we are confident, get quite bewildered among the various opinions held on the subject. Nevertheless, the work is valuable to all who are in quest of information as to how the question stands at the present time; and more valuable still to all practical foresters who have given some little attention to the subject, and who are seeking to trace the true cause of the destructive malady among our larch plantations. We are aware there will be diversity of opinion among Mr M'Intosh's critics; but let all read without prejudice, and most will derive information. Although the work is neither all that we could wish, nor, perhaps, all that we might have expected, let us welcome it as it is, and give the author due credit for what he *has* accomplished. We would say to fault-finders, Go and do likewise; and if you can produce anything better, we will welcome your book, and purchase it too. Would that we had many more as willing and able as our author to write on the other departments of arboriculture, for then we might indulge the hope that something like correct principles might be arrived at. Instead of this, each of us is plodding on in our own prejudiced, dogmatic way; and we stick to it just because few or none of the great principles which ought to guide us in carrying out the practical details of cultivating trees are satisfactorily settled questions.

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Return of Prices of Forest Produce, 1859.

*1. Country North of the Tay. 2. Fife and the Lothians. 3. South of Scotland and North of England. 4. Midland and South of England.

The quotations of Prices are understood to be the value of Produce at the Home Depôt.

	Prices for First Quality.								Prices for Second Quality.								Prices for Third Quality.								Pit Props: Price per Prop.				Notes of any local circumstances that may influence the value of different kinds of Forest Produce.
	Per Foot.				Per Ton.				Per Foot.				Per Ton.				Per Foot.				Per Ton.								
	*1.	2.	3.	4.	1.	2.	3.	4.	1.	2.	3.	4.	1.	2.	3.	4.	1.	2.	3.	4.	1.	2.	3.	4.	1.	2.	3.	4.	
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.		s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.		
Ash,	1 11	1 6½	1 10	1 6½	...	20 6	40 0	...	1 6	1 0	1 1	1 2	...	10 0	33 4	...	1 0	0 9½	...	...	5 0	5 0	33 4	...	...	0 4½	0 6	...	
Alder,	0 10	...	0 8	1 2	...	10 0	...	...	0 6	...	...	0 8	...	7 6	7 6	...	0 4	...	...	...	3 6	...	7 9	...	...	...	...	...	
Beech,	1 0	0 10	0 9	0 11¾	...	7 0	20 0	...	0 7	0 7	0 8	0 8	...	...	7 6	...	0 5	0 6	...	...	5 0	...	7 9	...	...	...	...	...	
Birch,	0 7	...	0 9	1 0	4 6	10 0	23 4	15 0	0 5	...	0 7	0 8	...	7 6	7 6	12 0	...	...	...	...	5 0	...	7 9	10 0	...	...	...	...	
Chestnut, Horse,	...	0 11	0 8	1 1	...	...	...	...	...	0 7	0 6	...	...	...	...	...	...	0 6	...	...	...	...	...	...	...	...	...	...	
Do., Spanish,	...	1 6	1 8	2 3	...	...	...	...	...	1 3	1 4	1 3	...	...	...	...	...	0 10½	...	...	...	...	...	...	...	...	...	...	
Elm, Scotch,	1 8	1 4	1 5	1 8	...	15 0	46 8	...	1 3	0 11	1 0	1 6	...	10 0	40 0	...	1 0	0 8½	...	...	5 0	...	...	...	...	...	...	...	
Do., English,	1 0	...	1 4	1 5	...	...	40 0	...	0 9	...	0 11	1 1	...	...	33 4	...	...	...	...	...	...	...	...	...	...	...	...	...	
Holly,	...	...	...	1 6	...	...	...	...	...	...	...	1 3	...	...	...	...	...	...	...	...	5 0	...	...	...	...	...	...	...	
Hornbeam,	...	...	0 11	1 3	...	...	...	...	...	...	0 6	0 11	...	...	...	...	...	...	...	...	5 0	...	...	...	...	...	...	...	
Laburnum,	...	...	...	1 6	...	...	...	...	...	...	...	1 4	...	...	...	...	...	...	...	...	5 0	...	...	...	...	...	...	...	
Lime,	0 6	1 0	0 10	1 11	...	...	...	...	0 4	0 8	0 7	1 2	...	...	...	...	...	0 6	...	...	5 0	...	...	...	...	...	...	...	
Maple,	...	...	...	3 0	...	...	...	...	...	...	...	2 3	...	...	7 6	...	...	...	...	...	...	...	...	...	...	...	...	...	
Oak,	2 0	2 2	2 4	3 0	...	18 0	80 0	...	1 6	1 6	1 6½	1 11	...	12 0	50 0	...	1 1	1 0	...	...	5 0	...	24 6	...	...	...	0 4	...	
Pine, Scotch,	0 8	0 11	0 11	1 1½	...	...	26 8	...	0 7	0 8	0 7	0 9	...	...	20 0	...	0 5	0 6	...	...	3 0	...	10 6	...	...	...	0 2	...	
Do., Spruce,	0 7	0 9	1 0	1 0	...	10 0	...	...	0 4½	0 7	0 7	0 9	...	...	...	...	0 4	0 6	...	...	...	...	10 6	...	...	...	0 6	...	
Do., Silver,	0 10	0 10	1 0	1 1	...	...	...	...	0 6¾	0 8	0 8	0 11	...	...	...	...	0 6	...	...	...	...	...	10 6	...	...	...	0 6	...	
Do., Larch,	1 2	1 3	1 3	1 6	...	17 0	50 0	...	0 10½	0 11	1 0	1 1	...	10 0	40 0	...	0 7	0 10½	...	...	...	...	30 0	...	...	...	0 4½	...	
Poplar,	1 0	0 11	0 9	0 10½	...	...	...	...	...	0 9	0 7	0 8¼	...	...	...	...	0 6	...	...	...	...	...	7 6	...	...	...	...	...	
Sycamore,	1 3	1 3	0 11½	1 3	...	8 0	27 6	...	0 11	0 10	0 8	0 11	...	6 0	16 8	...	0 8	...	...	...	5 0	...	7 9	...	...	...	0 5	...	
Walnut,	...	...	...	3 6	...	...	...	...	...	...	...	2 6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
Willow,	2 0	0 11	0 9	0 11	...	12 0	...	18 0	...	0 8	0 6	0 9	...	7 6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
Bark, Oak (Tree),	...	...	...	...	140 0	...	124 0	107 6	...	...	...	...	95 0	...	...	100 0	...	...	...	...	...	...	...	...	...	...	...	...	
Do., do. (Coppice),	...	...	...	...	...	...	147 0	125 0	...	...	...	...	...	...	...	110 0	...	...	...	...	...	...	...	...	...	...	...	...	
Do., Larch,	...	...	...	...	60 0	...	70 0	...	...	...	...	...	75 0	...	...	40 0	...	...	...	...	...	...	...	...	...	...	...	...	
Do., Birch,	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	

Information as to the Expense of Forest Labour in your District is also requested, particularly with reference to the following points :—

	1.	2.	3.	4.	
	s. d.	s. d.	s. d.	s. d.	
Day Labour,—Men,	2 2	1 11	2 5	2 0	per day.
Do., Boys,	0 10½	0 9	1 3	0 9½	do.
Do., Women,	0 10¾	0 9½	1 0	0 10½	do.
Digging Pits for Plants, Size———	3 3	1 4	...	1 6	per 100.
Fences (with description),	...	...	...	...	per rod of 5½ yards.
Drains (stating depth and width at top and bottom,	...	...	...	...	do. do.

* The numbers of the different districts correspond with those in the columns of prices.

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IX.—*On the Diseases of the Larch* (*Larix europæa*). By WILLIAM M'CORQUODALE, Forester, Scone Palace.

Writers on the diseases of the larch, have in general been led to account for their origin and progress from a constitutional weakness in the young plants, independently of external atmospheric influences. After upwards of thirty years' extensive practice, and much arduous investigation as a practical forester, I am constrained to dissent from the views commonly entertained on this subject; and I now venture with much diffidence to lay before the Scottish Arboricultural Society, in the form of a short Essay, the conclusions at which I have arrived.

The diseases peculiar to the larch may, I think, be classified under the two appellations of the *Dry-Rot* and the *Aphis Disease* (if I may be allowed so to call it), the former originating wholly in the nature of the soil, the latter induced by atmospheric influences, or more particularly by the larch aphis.

I.—*The Dry-Rot.*

This disease is so generally known, that it is unnecessary here to describe minutely the indications of its existence. Beginning at the root of the tree, immediately after the first formation of the red-wood, it soon ascends to the trunk, and, with each year's growth, continues to eat its way upwards until a great portion of the trunk is affected. With regard to the *cause* of this disease, a variety of circumstances have been assigned by different writers in support of their different theories. For my own part, I am now satisfied that it is attributable to the *soil*,—that is to say, to a particular sort of ground.

It is a very common practice, even with experienced practical planters, to plant larch on any soil, no matter what it be, and at the same time to mix it up with other firs, particularly with Scotch fir, which is very prejudicial to the growth of larch. It is well known that larch, as a forest tree, is decidedly the most profitable that can be put into the ground, providing it be planted in a soil congenial to its growth, but by no means so, when planted in inferior soils, such as poor moorish tracts of land, or on very light sandy loams resting on freestone and limestone rocks. In numerous instances, Scotch fir may be seen growing vigorously on such moorish ground up even to fine old timber. Whereas the larch, if planted on the same ground, is commonly seen pining away in a very sickly state. The same is the case on soil of a light sandy nature. On this description of ground the Scotch fir will flourish to old age, while the larch is generally much affected by rot long ere it arrives at maturity.

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These facts are patent to the observation of every unprejudiced forester, and they clearly demonstrate, that on certain descriptions of soil the larch is sure to be infected with the disease; and that the disease is attributable to the soil, is further obvious from the fact that on other kinds of ground, such as good deep loam, or clayey loam well drained, they are rarely touched. But where larch luxuriates best is on the slopes of hills, on a free loam,—on a shattery bottom resting on slate or granite rocks. On such soils I invariably found the larch quite free from dry-rot at every stage of its growth, from infancy to old age.

In planting new ground, instead of planting larch and Scotch fir as a mixed crop promiscuously over the whole ground, if the permanent crop be intended to be of larch, I would recommend that particular attention be directed to the nature of the soil, and that all the ground suitable for carrying larch, and congenial to its growth, should be planted wholly and entirely with it at four feet apart, and upon no account to allow other fir to be intermixed with it. All inferior ground should then be planted wholly with Scotch fir as the intended permanent crop, with larches intermixed in equal numbers at four feet plant from plant. The larch will certainly contribute to the ornamenting of the plantation, and they will also be found much more valuable as thinnings for estate purposes or for the market.

Neither should larch be planted after a previous crop of Scotch pine has been cut away; for as soon as the fibrous roots of the young larches come in contact with the decayed old fir stools, they are generally affected with dry-rot, and thereby the disease is conveyed to the trunk of the tree; and although the young trees may appear for a time to be healthy and strong, and continue to thrive for a considerable period unchecked in their growth, still the root may all the while be internally carrying on its work of destruction. To understand how this can be, it is only necessary to keep in mind that the dry-rot confines itself to the red-wood exclusively, and the tree receives its nourishment wholly through the sap-wood; consequently the disease may exist without retarding the growth of the tree. But what is the result if this apparently healthy tree be cut down? It will then be found that the rot has penetrated into the heart of the trunk, and that the tree is in a manner lost.

I have said that larch should never be planted after Scotch fir, and it is to be regretted that proprietors of woods, for their own interest, do not sufficiently attend to this. In consequence of the great demand which exists at present for Scotch fir, many wood proprietors I know have cut down extensive plantations of old fir, with the view of planting up the same ground, as soon as cleared, with larch. I would beg respectfully to caution them against so injudicious a procedure; for although the fatal consequences of it

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may not be perceptible for a long time, yet, ultimately, they will not fail to discover themselves. The larch planted upon such ground will not have arrived at twenty-five years of age before it will be found to be affected by the dry-rot, and rendered comparatively useless.

II.—*The Aphis Disease.*

The disease to which I have given this name proceeds from the top of the tree, and the extreme points of the branches, and was very prevalent in Scotland from 1838 to 1842, during which period its ravages were fearfully extensive among the young larch plantations. Soon after this disease made its appearance, my employer and I differing as to its cause, I instituted a variety of experiments, with the view of determining this disputed question. Having provided myself with a good microscope, I immediately went to work grubbing up the roots of diseased trees; but after the most careful examination, I could discover no traces of the disease *there;* even in trees that were much exhausted the roots appeared quite healthy. Convinced that this disease did not proceed from the root, I next directed my researches to the top of the tree, when, after careful observation, I at length discovered what I believe to be the true cause of the disease, viz., a species of Aphis called the *Adelgis laricis.*

These insects make their appearance as early in the season as the middle of April, and immediately begin to propagate on the extremities of the branches. By the aid of the microscope, I have, in some instances, seen fifty eggs hatched in a brood by one female.

As soon as they are hatched the young ones spread themselves over the foliage and the young growths, where they remain stationary, extracting the substance of the tree until they grow to a perfect state, when they take wing in succession and depart. But from their unceasing propagation during summer, the trees continue to be infested by successive broods of them during the whole of that season.

Since the summer of 1842 these insects have, comparatively speaking, ceased; but during the four years preceding that date their ravages were truly astonishing. A person standing underneath a diseased tree, and looking towards the top of it, in a warm summer day, would perceive the whole foliage and young growths covered as it were with *dew*, but which, on examination, was found to be the substance of the tree oozing out with the heat of the sun, from the innumerable punctures made by the insects which at the same time were fixed there. This, of course, is bleeding the tree to death, in consequence of which the extreme points of the branches become sapless, and die away; and the sap being prevented from circulating throughout the branches, is thrown back into the stem, thus frequently causing eruptions of

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the sap-vessels, as well as ulcerated wounds upon the stems, from which the vital substance of the tree exudes. Trees which have been attacked by the insects, and in consequence partially retarded in their growth, if not too much exhausted, will rapidly recover and assume a healthy appearance, once the insects have discontinued their annual ravages; but such as show large ulcerated wounds upon their stems will seldom recover, as the sap will continue to flow out until the tree is entirely exhausted, and its vitality gone.

Many other kinds of forest trees, from the oak down to the thorn in the hedge, are subject to the attacks of insects, as well as the larch; and it is not to be wondered at that the larch should experience its ravages in common with other trees. We know that the silver fir is often destroyed by a bug; also Scotch pine, fruit trees, &c., are all infested by insects peculiar to themselves.

I might mention many other kinds of trees that are subject to the ravages of insects in the same manner as the larch has been to the ravages of the aphis. But as it is unnecessary to dwell upon this, I shall only, therefore, further allude to a species of aphis which attacks the apple tree, called the *American Bug*, an insect which is well known to practical gardeners as extremely injurious in its operations. When it has once attacked young apple trees, however healthy and vigorous they may have previously been, this destructive insect will soon overcome them, and produce canker, and large ulcerated wounds upon the limbs and stems of the trees, precisely similar in appearance to those produced by the aphis upon the larch.

During the years when the disease was so prevalent, I found that all our young plants, as they came from the nurseries, were diseased. That, however, is not the case now. The plants, generally, are quite healthy, and discover no indications of having been touched by the insect.

With regard to the most effectual means of preserving the plants from this insect's ravages, I may state that I have tried washing them with several powerful solutions, but without effect. The best remedy I have hitherto tried was to cut down all the trees that were exhausted by the disease, and at the same time give the plantation a general thinning, brushing down off the boles of the trees all the dead wood, thus admitting plenty of light and air throughout the plantation. Many of the larch plantations of which I have the management, after being thus treated, recovered amazingly, and now appear quite healthy.

I am disposed to believe that it was owing to some extraordinary change of atmospheric influences that those insects propagated in such overwhelming multitudes from 1838 to 1842, and then suddenly ceased, and seem to have disappeared considerably. This insect, peculiar to the larch, is perhaps as old as the larch

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itself, although it has never been known to breed to such an extent as during those years; and in its native country the larch is not altogether exempt from its attacks. In 1840 and 1841 I travelled over the greater part of Scotland; and the districts where the least injury was done to the larch were those of Braemar and Strathdon, in Aberdeenshire; and Loch-Awe and Loch-Fine sides, in Argyleshire.

Had the aphis raged with the same virulence for the four years succeeding 1842 as it did the four years preceding, there would scarcely be a larch tree then existing in Scotland under thirty-five years of age. It is probable that a long time will elapse ere we have a recurrence of the same atmospheric influence, and, consequently, no repetition on the same extensive scale of the ravages committed among our larch plantations during the above-mentioned period by the *Adelgis laricis.*

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X.—*On Successful Planting with Scotch Fir (Pinus sylvestris), after previous Crops of old Scotch Fir had been removed from the Ground.* By WILLIAM M'CORQUODALE, Forester, Scone Palace.

It has been well known, probably for the last two centuries, that young Scotch fir would not succeed when planted immediately on ground from which a crop of Scotch fir had been previously cleared away. But it was only recently that this was found to be owing to the ravages of the wood beetle, *Hylobius abietis;* and, so far as I could learn, I was the second person in Scotland who discovered this insect's work of devastation among newly planted Scotch fir.

After thirty years' experience, and much patient investigation, as a practical forester, in the planting of ground of this description, I am quite satisfied, since the discovery of these destructive insects, that they propagate in the scaly bark which falls from the trees during the felling of the timber, independently of the stools.

In 1841, after cutting an old fir plantation immediately behind New Scone, the villagers were permitted to grub up the stools for fuel, in order to clear the ground for planting. This they did so effectually that scarcely a single stool was left. In the course of the following spring, the ground having been thoroughly drained and enclosed, about seven acres were planted with oak, and with larch, spruce, and Scotch fir intermixed as nurses; and the remainder, consisting of about fifteen acres, was replanted with Scotch fir, slitted into the ground, according to the ordinary mode of planting them. This was done in February 1842, and in the following May I observed that great numbers of them were dying away every day. Being fully persuaded in my own mind that the whole had been most carefully planted, I was quite at a loss how to account for this failure, or to what cause it was to be attributed. About the end of May, after a careful inspection of the deceased plants, I discovered the insect at work, and forwarded one to my employer, who was then in London, that he might ascertain its name. It was my intention, at the same time, to have reported this insect to the Highland and Agricultural Society of Scotland, when a gentleman informed me that I had been anticipated by Mr Balden, forester at Lennoxlove, Haddington, who had discovered the beetle's work of devastation the previous year, and had already reported it.

The existence of this insect, and its destructive operations, being satisfactorily ascertained, the next important consideration was —how to protect the young trees from its ravages. The following measures were immediately adopted by me :—I turned into the plantation fifteen of our peelers—women and boys—with bottles, into which they were to collect the insects from off the young trees.

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In the course of one day they collected above five thousand of them. I then prepared a mixture of coal-tar and lime, about the consistency of cream, and with paint brushes applied it to the stems of the plants. In a day or two afterwards it dried up, when the beetle picked it off in scales, which fell to the ground, and fed on as freely as before.

Finding these means ineffectual for the protection of the young trees, I resorted to others which I shall now describe, and the results of which proved quite successful. In the course of the following spring I filled up all vacancies with young plants, and went over every individual plant, laying a layer of earth round the neck of each; and after treading it firmly down, and giving it a beat with the back of the spade, boys followed with pitchers containing the powder of hot lime, with which each layer of earth was covered over. This I soon found to answer the purpose well; for as soon as the beetles, when in search of food, came in contact with the hot lime, they immediately steered their course in another direction, and left the plant untouched.

Again, in 1843, we finished the cutting of an old Scotch fir plantation, extending to about one hundred acres. Early in spring I got a hundred Scotch firs planted in it, fifty of which were slitted into the ground, and the other fifty carefully pitted, breaking the surface well into the bottom of the pit, and the stiff clay, taken from the bottom, filled in last upon the top, when it was smoothed over with the back of the spade, to prevent the beetle lodging about the rough surface. This was done one year before the ground was prepared for planting, with the view of ascertaining which would be the most advantageous method of planting the whole ground in the ensuing year. Upon examining the above plants the following autumn, along with my employer, he saw at once the propriety of planting it wholly by pitting. Those of the plants which had been slitted into the ground were entirely destroyed by the beetle; whereas the pitted ones were healthy and vigorous, made good progress, and stood quite uninjured.

In spring 1844 the whole of this plantation was planted, by pitting with Scotch fir. The pits were opened by contract, four feet apart, being 3422 pits to the Scotch acre, at the rate of 30s. 10d. per acre. The plants were planted into the pits by men on day's wages, which cost 15s. per acre, making a total of 45s. 10d. expense per acre for planting. The pits were in size 15 inches in diameter and 10 inches deep. The surface was carefully broken and mixed with the best of the soil into the bottom of the pits, and the clay taken from the bottom was filled in last. The clay on the surface remains a long time clean, and free from any foulness growing into it. The pits were well trodden down, and beat with the back of the spade, in order to smooth the surface and prevent the beetle harbouring in them, which it would do were

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the surface rough. Five acres of this plantation were at the same time planted by slitting, to see how they would succeed. At the end of the season they proved a total failure, having been wholly destroyed by the beetle during the summer. The pitted ones, on the contrary, remained uninjured, and appeared quite healthy and strong. During winter, however, they suffered much; having been planted in a tract of moorish land, with very retentive subsoil, about 30,000 of the pitted plants were thrown out by the frosts of winter. The following spring their places were supplied by fresh plants, and all have done well since.

In spring 1846 an old Scotch fir plantation of twenty acres, upon the estate of Innernytie, was cleared out for planting. Being a flat piece of poor moorish land, and being thickly studded with Scotch fir stools, I was satisfied that Scotch fir was the only crop of trees that would grow to profitable timber upon it. At the same time, I was much at a loss how to proceed in planting them; for if pitted, the frost would throw them out in this description of soil; and if slitted into the ground, the wood-beetle would destroy them. How, then, were they to be planted to escape the two-fold danger to which they were thus exposed?

The following was the mode of planting I adopted; and which, I am happy to say, has proved the most successful method of any hitherto adopted.

The planter, by turning the face of the spade towards him, makes a perpendicular cut down into the ground about a foot long, he then makes another cut across the centre, holding the spade in the natural way, and placing it four inches back from the first cross cut, the spade is thrust down.

The planter then takes the plant in his hand, gathering up the branches, and, pressing the handle of the spade towards the ground, he slips the root underneath the spade, and moving the plant forward, makes it stand erect in the first cross cut. The ground is then well, but carefully, trodden down around it; and lastly, three large spades full of earth are taken up about two feet back from the plant and laid down around its neck, forming a layer of about 15 inches diameter round the plant. This layer of earth must be likewise firmly trodden down and beaten with the back of the spade to smooth the surface, in order to prevent the beetle lodging about it.

Such was the manner in which I planted up this piece of ground after it had been thoroughly drained and enclosed.

The plants were put in 4 feet apart. The expense of planting this plantation, by slitting and earthing around the necks of the plants in the manner above stated, amounted to 22s. per imperial acre.

In the above planting of 20 acres there was scarcely a plant failed; but if, perchance, a plant was found that had been neglected

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to be properly earthed, it was either devoured or rendered useless by the beetle.

In 1851 we finished the cutting of 27 acres of old Scotch fir, which was immediately after thoroughly drained. The drains were laid in at 36 feet apart, and 2½ feet deep. The castings from the drains were laid in equal quantities on each side of the drains, for the purpose of securing earth conveniently from them for earthing the young trees during the planting operations. After this plantation was cleaned and drained, it was allowed to stand over for a year before it was planted, on purpose to rear up as rank a crop of herbage as possible; and early in March the herbage was carefully and effectually burned all over, with the view of destroying the eggs of the beetle.

The ground was all planted up, immediately after having been burned, with strong two years' transplanted Scotch fir plants, at 4 feet apart, and the plants were all earthed from the castings of the drains. The cost of planting per imperial acre amounted only to fifteen shillings.

Of all my experiments in planting with young Scotch fir, after previous old Scotch fir crops, the above has been the most successful, and above all others is the mode of planting I recommend to other planters.

After a crop of Scotch fir is cleared away, the whole ground should be effectually drained, if necessary, at 36 feet apart, and 2 to 3 feet deep, as may best suit the nature of the soil. The castings from the drains should be laid down in equal quantities on each side of every drain, for the convenience of furnishing earth for earthing the plants.

After the ground is thoroughly and effectually enclosed, and all brush and wood have been cleared out, the ground should be permitted to lie over for at least one year, during which time the ground should be strictly protected from being pastured by stock of any description, in order to rear up as rank a crop of herbage as possible. Early in March, in dry weather, the whole herbage should be carefully burned all over the ground intended for planting.

The drains will keep the burning within bounds, and, with a little care and caution, it may easily be prevented from over-running to any adjoining cover.

After the operation of burning is completed, the planting should be proceeded with immediately. And to withstand the beetle, and to enable the plants to get speedily beyond the risk of being attacked by it, I would recommend strong two years' transplanted plants, which, if carefully planted on the system of double slitting, as already described, with a substantial layer of earth, will keep clean for a long period; and if the work is carefully performed, the plants are secure from the beetle. Independently

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of protecting the plants from the beetle, this layer is very serviceable in supporting the young trees, and preventing the summer draughts from opening the slits. If the plants are healthy and strong when planted, they will, by the second year, be beyond the reach of being much damaged by the insect.

I have planted several hundreds of acres with young Scotch fir—after old Scotch fir crops—within the last twenty-five years, in different counties; and I venture to assert that these young plantations will bear comparison with any plantations in our country that have been planted on new soils of equal quality.

Many of these plantations have been already thinned twice and three times. I have at present upwards of two hundred acres of these of my own planting, ready for their third course of thinning, and furnishing thinnings beautifully adapted for pit-wood, &c.

I respectfully invite planters, and others interested in planting with young Scotch fir after old Scotch fir crops, to inspect these plantations, which I consider well worthy of notice; and I shall feel much pleasure in showing them to any person who may feel disposed to visit them, and affording them any further information relative to the subject which is in my power to give.

In conclusion, permit me to offer a word of advice to wood proprietors in regard to the treatment of land of this description. In consequence of the great demand of late years for Scotch fir timber, I am aware that large tracts of land are constantly clearing out, and I am well aware that a great portion of this will be injudiciously planted. There is a prevailing impression among wood proprietors and foresters that young Scotch fir will not thrive after a crop of old Scotch fir. Visit the young plantations under my management, and the result will remove at once these misgivings.

I consider a crop of Scotch fir as decidedly the most profitable crop of any kind of trees that can be planted on a poor moorish soil. On any soil that has already produced a good crop of our native pine I have no fear whatever of being able, on my system of planting, of rearing successfully a second crop; and if land of this description be thus treated, it will amply remunerate the proprietor for his trouble and expense, if followed up afterwards with judicious training.

I beg further to observe, that, to be successful, game must be kept down, or the plantation must be effectually enclosed against hares and rabbits.

The cheapest and best fence against hares and rabbits that I have adopted is the galvanised wire netting, 1½ inch mesh, and is made of wire number 19, is 3 feet wide, and the cost 7d. per lineal yard. When the plantation is so far advanced as to require no further protection, this wire netting can easily be removed, and sent to any distance for similar use.

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APPENDIX (A.)

GENERAL ABSTRACT OF THE ACCOUNTS

OF THE

SCOTTISH ARBORICULTURAL SOCIETY,

for 1858–9.

CHARGE.

1. Balance in Treasurer's hands,	£4	11	2
2. Annual Subscriptions received,	38	15	0
3. Cash from Sale of Transactions,	0	15	0
4. Subscriptions paid in advance,	0	13	0
5. do. in arrear, paid,	3	7	6
6. Cash received from Bank,	5	0	0
	£53	1	8

DISCHARGE.

1. Advertising,	£7	1	5
2. Postages, Carriages, &c.,	1	2	11
3. Printing and Engraving,	1	6	0
4. Stationery,	1	2	11
5. Rent of Room,	0	5	0
6. Cash put into Bank,	42	3	5
	£53	1	8

Edinburgh, 6th October 1859.

I have examined the books of the Treasurer of the Scottish Arboricultural Society, and the vouchers up to this date, and have found them correct.

(Signed) THOMAS METHVEN.

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LIST OF MEMBERS

OF THE

SCOTTISH ARBORICULTURAL SOCIETY.

(*Corrected to 8th October* 1859.)

ADAIR, Sir Shafto, Bart., Flixton Hall, Bungay, Suffolk.
AIRLIE, Earl of, Cortachy Castle, Forfarshire.
ALEXANDER, James, Nursery and Seedsman, 1 Waterloo Place, Edinburgh.
ALEXANDER, William, Nurseryman, Banff.
ALLAN, John, Forester, Crathes Castle, Aberdeen.
AMOS, William, Assistant Forester, Whittinghame, Prestonkirk.
ANDERSON, John, Nurseryman, Perth.
ARCHER, James.
BALDEN, John, Lennoxlove, Haddington.
BALDEN, John, Bywell Castle, Stocksfield, Newcastle-on-Tyne.
BALLANTYNE, John, Nurseryman, Dalkeith.
BATHGATE, A., Assistant-Forester, Bowhill, Selkirk.
BATTY, William, Forester, Netherby, Longtown.
BAXTER, Mr, Forester, Riccarton, Edinburgh.
BINNING, John, Esq., Factor, Tulloch Castle, Dingwall.
BISSET, David, Forester and Land-Steward, Alva House, Alloa.
BLACK, James, Esq., Factor, Robertland House, Stewarton.
BORTHWICK, William, Forester, Dunnichen, Forfar.
BOW, Andrew, Forester, Cleghorn, Lanarkshire.
BROUGH, Mr, Forester, Hamilton Palace.
BROWN, Charles, Esq,, Factor, Gartmore, Stirling.
BROWN, Edward, Assistant-Forester, Champfleuri, Linlithgow.
BROWN, James, Wood-Commissioner, Grantown, Strathspey.
BROWN, William, Esq,, Factor, Invercauld, Aberdeenshire.
BUCHAN, George, Forester, Bakewell, Derbyshire.
BUIST, Matthew, Esq., Factor, Tynninghame, Prestonkirk.
CAMERON, Archibald, W. F., Esq. of Lakefield, Glen Urquhart, Inverness.
CAMPBELL, Archibald, Forester, Adderly, Market Drayton, Salop.

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CAMPBELL, Donald, Forester to Earl of Wemyss, Wemyss Castle, Kirkcaldy.
CHALMERS, John J., Esq., Aldbar, Brechin.
CHAMBERS, William, Esq., Haford, Cardiganshire.
CLARKE, John, Esq., Agent, Featherstone Castle, Haltwhistle, Northumberland.
CLEGHORN, William, Forester, Aytoun Castle, by Aytoun.
CLUES, William, Forester, Charleton, Fife.
COWAN, James, Assistant-Forester, Arniston, Gorebridge.
COWAN, Robert, Arniston, Gorebridge.
COWIE, James, Forester, Calder House, Mid-Calder.
DARLING, John, Forester, St Martins.
DICK, R., Forester, Cullen House, Banffshire.
DICKSON, James, Esq. of Chatto, Coldstream.
DICKSON, James, Forester to the Earl of Seafield, Glen Urquhart, Inverness.
DICKSON and Sons, Messrs James, Nurserymen, Edinburgh.
DONALDSON, Mr, Forester, Brechin Castle, Brechin.
DUCIE, Earl of, Tortworth Court, Wotton-under-Edge, Gloucester.
DURRAN, Mr Wm., Forester, Altguissack, Ballater.
EARNSHAW, Mr L., Forester, Morpeth, Northumberland.
FORBES, Thomas, Emo Park, Portarlington.
FOWLES, R., Forester, Fordel, Aberdour.
France, Mr George, Assistant Forester, Abernethy, Strathspey.
FRASER, P. Neill, Esq., Canonmills Cottage, Edinburgh.
GALLOWAY, Charles, Forester, Halston Hall, Oswestry, Salop.
GARDINER, Alexander F., Esq., Factor, Balnagowan, Tain.
GARDINER, Robert, Forester, Eglinton Castle, Ayrshire.
GARDINER, Mr R., junior, Eglinton Castle, Irvine.
GIBSON, John, Esq., Land-Agent, Milton Abbey, by Blandford, Dorsetshire.
GILCHRIST, A., Assistant-Forester, Wemyss Castle, Kirkcaldy.
GORDON, John, Forester, Durris, by Aberdeen.
GORRIE, Archibald, Forester, Holkam, Norfolk.
GOUGH, William, Forester, Monnymusk, Aberdeen.
GRIEG, Gavin, Forester, Parkhill, Aberdeen.
GREIG, George, Esq., W.S., 9 Abercromby Place, Edinburgh.
GRIGOR, John, Nurseryman, Forres.
GUTHRIE, David, Forester, Hafodunos, Llanrwst, Denbighshire.
GUTHRIE, George, Esq., Factor to Earl of Stair, Culhorn, Rephad, Stranraer.
HALL, Peter, Forester, Balharry, Meigle.
HALL, Sir John, Bart., Dunglass, Cockburnspath.
Hay, Mr, Forester to Earl of Seafield, Boyne, Portsoy.
HENDERSON, George, Nurseryman, Brechin.
HOBBS, Harry, Forester, Woodovis, Tavistock, Devon.

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JOHNSTON, John, Land-Steward, Douglas Castle, Lanark.
JOHNSTON, John, Assistant-Forester, Cullen House, Banffshire.
KECK, G. A. Legh, Esq., Staughton Grange, Leicestershire.
KELVRAIN, John, Assistant-Forester, Cullen House, Banffshire.
KENNEDY, Right Hon. T. F., Dalquharran Castle, Maybole.
LAIRD, R. B., Nurseryman and Seedsman, Edinburgh.
LAMOND, William, Forester to Earl of Airlie, Cortachy Castle.
LAMONT, Mr, of James Dickson and Son, Edinburgh.
LAWSON, George, Kingston, Canada West.
M'CALL, Richard, Forester, Gilston Castle, Castle-Douglas.
M'CALLUM, G. K., Esq., of Braco Castle, Braco.
M'CORQUODALE, William, Forester, Scone Palace, Perth.
M'CORQUODALE, Archibald, Forester to Lord Lovat, Beaufort.
M'CORQUODALE, Donald, Forester to the Duke of Sutherland, Dornoch.
M'DONALD, John, Forester, Bridgend, Islay.
M'EWAN, Mr, Forester, Corsock, Corsock Bridge.
M'GIBBON, Charles, Esq., 37 East Claremont Street, Edinburgh.
M'GREGOR, John, Forester, Tynrich, Dunkeld.
M'GREGOR, Mr, Forester, Lyndoch, Perth.
M'KAY, James, Forester, Newton Don, Kelso.
M'KENZIE, K. Stewart, Esq., Seaforth, Urray Cottage, Beauly.
M'LAREN, Hugh, Forester, Shaw Park, Alloa.
M'LAREN, John, Forester, Hopetoun House, South Queensferry.
M'LEISH, Mr, Forester, Yetholm.
M'LEOD, George, Forester, Whittinghame, Prestonkirk.
M'LEOD, James, Assistant-Forester, Whittinghame, Prestonkirk.
M'NEILL, Mr, Forester, Abercairny, Crieff.
M'RITCHIE, T. E., Esq., 4 Gayfield Square, Edinburgh.
MACBETH, Mr, Land-Stewart, Stobhall, Perth.
MACTIER, Alex. Walker, Esq. of Durris, Aberdeenshire.
MAGGOCH, John, Assistant-Forester, Arniston, Gorebridge.
MAKAY, Thomas, Forester, Loanhead, Selkirk.
MARSHALL, John, Forester, Lambton Park, Fence Houses, Durham.
MARTIN, James, Esq., Monedie, Aberchirder, Banffshire.
MELROSE, John, Assistant-Forester, Logiealmond, Perth.
MENZIES, William, Forester, Cortachy Castle, Kerriemuir.
METHVEN, Thomas, Nurseryman, Stanwell Lodge, Edinburgh.
MILLER, John, Forester, Gorthie, The Cairnies, Perth.
MITCHELL, A., junior, Forester, Tullyallan, Kincardine-on-Forth.
MITCHELL, D., Forester, Amisfield, Haddington.
MOFFAT, Adam, Forester, Easton Lodge, Dunmore, Essex.
MONRO, James, Forester to the Marquis of Northampton, Easton Maudit, Northampton.
MURRAY, David, Forester, Dunira, Perthshire.
MURRAY, James, Superintendent of Cemetry, Paisley.

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MURRAY, John, Esq., of Touchadam and Polmaise, Stirling.
NELSON, W., Forester, Adlington Hall, Lanarkshire.
PALMER, John, Nurseryman, Annan.
PARKER, James, Forester, Belvoir Castle, Grantham.
PATTERSON, Andrew, Land-Steward to Right Hon. Lord Rollo, Duncrub, Dunning, Bridge of Earn.
PEARSON, David, Nurseryman, Castle-Douglas.
PHILIP, Robert, Forester, Aldbar, Brechin.
PORTSMOUTH, Earl of, Eggesford, North Devon.
PURVIS, Mr., Forester to Marquis of Stafford, Tarbet, Parkhill, Ross-shire.
RAMSDEN, Sir J., Bart, Buckden, Skipton, York.
RAVENSCROFT, E. J., 1 George IV. Bridge, Edinburgh.
REID, David, Nurseryman, Leith Walk, Edinburgh.
RITCHIE, Walter, Assistant-Forester, Arniston, Gorebridge.
ROBERTSON, James, Forester, Morwick-Acklington, Northumberland.
ROBERTSON, P. S., Nurseryman, Edinburgh.
ROBERTSON, Thomas, Forester, The Cairnies, Perthshire.
ROBSON, Alexander, Forester, Glenalmond, Perth.
ROGERS, William, Forester, Teddesley, Staffordshire.
RUTHERFORD, James, Forester to Lord Douglas, Linthaugh, by Jedburgh.
RUTHERFORD, J., Forester to Sir John Ramsden, Bart., Buckden.
RUTZEN, Right Hon. Baron Frederick de, Slabeck Hall, Haverfordwest.
SANDBACK, Henry R., Esq., Hafodunos, Llanwrst, Denbighshire.
SANG, Walter, Nurseryman, Kirkcaldy.
SAUNDERS, Robert, Forester, Strathtyrum, St Andrews.
SCOTT, Archibald, Nursery and Seedsman, 1 Waterloo Place, Edinburgh.
SCOTT, David, Assistant-Forester, Culhorn, Wigtonshire.
SCOTT, John, Assistant, Cortachy Castle.
SCOTT, Thomas M'Millan, Esq. of Wauchope, Hawick.
SHANKS, James, Forester, Aberlour House, Craigellachie, Banff.
SHELLEY, Sir John Villiers, Bart., M.P., Maresfield Park, Sussex.
SINTON, John, Assistant-Forester, Dungannon Park, Dungannon, Ireland.
SKIRVING, Archibald, Forester, Horningsham, Longleat, Warminster, Wiltshire.
SKIRVING, William, Nurseryman, Liverpool.
SLEIGH, Mr J., Manager, Strichen Castle, Strichen.
SMITH, Alexander, Forester, Dalhousie, Lasswade.
SMITH, James, Esq., Factor, Dunglass, Cockburnspath.
SMITH, James, Forester, Donibristle, Fife.
SOMMERVILLE, Dr, 17 Hart Street, Edinburgh.

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STAIR, Right Hon. The Earl of, Oxenford Castle, Dalkeith.
STARK, Robert M., Edgehill Nursery, Edinburgh.
STEELE, David, Forester, Skene House, Aberdeen.
STIRTON, Robert, Forester to Lord Portsmouth, Eggesford, North Devon.
TAYLOR, Thomas, Forester, Camperdown, Dundee.
THOMSON, John Grant, Forester, Abernethy, Strathspey.
THOMSON, William, Deputy-Surveyor, Chopwell Woods, Ebchester, Gateshead.
TURNBULL, John, Assistant-Forester, Minto House.
TURNBULL, Thomas, Forester, Underwood, Plympton, Devonshire.
TURNBULL, William, Forester, Torr House, Auchencairn, Castle-Douglas.
TURNER, F. J., Esq., Dean House, Kilmarnock.
TWEEDIE, John, Forester, Champfleurie, Linlithgow.
WALKER, W., Overseer and Forester, Bellabeg House, Aberdeenshire.
WATSON, James, Forester, Mugdrum, Newburgh.
WHITE, James, Assistant, Chopwell.
WIGHT, Andrew, Assistant-Forester, Buckden.
YEAMAN, William, Forester, Birkhall, Ballater.

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PRIZE ESSAYS FOR 1860.

The Society, at its Meeting in October last, agreed to offer prizes for Essays on the following subjects, these to be lodged with the Secretary not later than 1st September 1860:—

1. *Introduction and Cultivation of the newer Coniferæ and other Forest Trees;* with special reference to the Climate of Great Britain and Ireland. (*Silver Medal.*)

2. *Preparation of Waste Land for Planting.* (*Silver Medal.*)

3. *On the successful Raising of Two Crops of Scotch Fir in Succession, on Moorland;* the Crop reported on to be not less than twelve years old. (*Silver Medal.*)

4. *The best Season for Felling Timber of various kinds;* with a view to future Durability. (*Silver Medal.*)

5. *The best Method of Rearing and Maintaining Live Fences;* with an Account of the Plants best fitted for filling up Gaps in old Hedges. (*Silver Medal.*)

NOTICE.

The next Annual Meeting of the SCOTTISH ARBORICULTURAL SOCIETY will be held in the Society's Meeting-Room, 6 YORK PLACE, EDINBURGH, on the First Wednesday of November 1860, at Half-past Twelve o'clock.

Applications from Gentlemen desirous of becoming Members of the SCOTTISH ARBORICULTURAL SOCIETY may be addressed to Mr ROBERT M. STARK, Secretary, 6 *York Place, Edinburgh*, from whom the Society's *Transactions*, copies of the *Laws*, particulars of Prizes for *Competition Essays*, and all other information, may be obtained.

Subscriptions are received by Mr JOHN ANDERSON, Nurseryman, *Perth*, the TREASURER, to whom all communications relative to the Society's financial affairs should be addressed.

Members in arrear are requested to obtain their receipts from the Treasurer without further delay.

ROBERT M. STARK, *Secretary*.

SCOTTISH ARBORICULTURAL SOCIETY'S ROOMS,
6 YORK PLACE, EDINBURGH.

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APPENDIX (B).

THE following letters from absent Members were read at the last Annual Meeting of Members, and from their bearing on subjects affecting the interests of the Society, it was unanimously agreed that they should be published. The Sub-Committee on "Transactions" accordingly present them in the succeeding Appendix:—

MORWICK HALL, 15*th Jan.* 1860.

DEAR SIR,—Much has been said about the growing of timber, &c.: do you think that anything said about the disposal of it after growing to maturity would be of any service to the Society? If you thought so, I could give a few lessons upon the sliding-rule, so that even a person who never measured timber before could do so in a moment by reference to this rule.

The instructions will be very plain, and any person practising it will be able to measure trees from one foot up to thousands as quick as they can turn over the leaves of a Hoppus or a Peddie.

If you think well of this, I will be happy to give you more information upon the subject. And if you could send me a report of the Society with the members' names in it, I think I can get some more to join the Society in this quarter.—I am, Sir, yours, &c.,

J. W. ROBERTSON.

Mr Stark, *Secretary.*

October 1860.

SIR,—I have never had the pleasure of attending any of the annual meetings of your Society, nor is it likely that I shall ever have it in my power to do so: personal circumstances conspire to preclude me from giving aid except as a well-wisher, looking on at a distance, and perchance making a suggestion now and then as the spirit moves me. Pray excuse a little harmless egotism to begin with.

As far back as 1833, there appeared in the late Mr Loudon's "Gardeners' Magazine," for October of that year, an Essay of

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mine on the diseases of the Larch. In that paper I suggested the formation of a National Arboricultural Society, and urged the propriety—nay, the necessity—of such an Institution at considerable length.

On the publication of the Essay, my views were then met with a storm of verbal opposition from my contemporaries—the idea of a Foresters' Society was a wild flight of fancy from a disturbed brain, &c.; yet I have had the satisfaction of living to see some of the detractors, if I mistake not, become members of the Scottish Arboricultural.

In my Essay, which will be seen on reference to the "Gardeners' Magazine" for October 1833, I predicted that sooner or later the necessity for a Sylvan Society would force itself upon public attention, and I leave you to judge of my gratification when, after many long years, I saw my ideas partly realised; when, through the instrumentality of more influential hands and clearer heads, the Scottish Arboricultural Society became an accomplished fact.

Although I have said nothing hitherto on the subject, still I have long been of opinion that the machinery of your Society might be greatly improved and advantageously extended, whereby the annual meetings would become more instructive and attractive.

For example, there might be an exhibition of small samples of first-class seedling plants of all the leading forest trees; and, for the better tuition of the embryo forester, these samples might be contrasted upon the same *stand* with samples of an inferior description. Transplanted trees, suited for immediate forest occupation, might be exhibited after the same manner. By such means young men intending to become foresters, after witnessing a few such exhibitions would become instructed to judge at sight between a sample of worthless unhealthy plants and those of an opposite character. Let it never be lost sight of that success in planting very much depends on judicious selection by the forester of the trees which he is about to plant, and also on the manner in which the plants are treated after coming under his care from the nursery, until they are finally disposed of.

Into exhibitions of this sort, there ought to be no necessity for the introduction of the element of competition, for I am convinced that no nursery could provide a bulk equal to the sample that I should wish to be shown. The samples should all be of the most handsome and well-grown plants that could be selected, say 20 or 30 in each sample. From these samples the young forester would soon make himself qualified to judge and purchase by comparison.

These sample plants would of course be provided by the public nurserymen; but where a private nursery is kept on the estate, the forester might come forward and show his skill at tree-rearing.

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I do not see that these exhibitions, being merely made for the instruction of young foresters, could, in the least degree, interfere with the interests of the professional nurseryman, but, on the contrary, would become advantageous to the exhibitor.

Again, foresters might exhibit the raw material of the forest productions in the shape of small slabs of all the varieties of timber grown upon the estate—say inch boards, a foot long by eight or ten inches wide, smoothed with the plane on one side and varnished, the better to show the sometimes fantastic form of the wood grain. Slabs might be shown of various ages of the same kinds of trees, to mark out to us the rate of progress toward maturity. There are also some trees the roots of which are very ornamental when dressed, such as the ash, the elm, and the oak. Slabs of these might be brought forward, and, let me see, why not exhibit rustic chairs and tables, models of sylvan temples, wood gates, &c., &c.

Again, there might be transverse sections of trees, showing the accumulated deposits of sap wood on annual concentric rings; and also showing the commencement and progress of the heart-disease, such as we see in the larch, spruce, and poplar.

A prize might be offered by the Society against some future year to the forester who shall then produce a faithful record of the annual increase in circumference of the greatest variety of growing trees, the girths to be taken at given heights once a year—say at one foot, at three feet, and at six feet from the ground.

Now to some this operation may seem very simple and of easy accomplishment, but to attain the necessary exactness of statement is a matter of some difficulty. Without a guide, one may take the girth of any tree at three feet from the ground; but ten to one if, in any future measurement, the measuring tape can be laid on the same line on the bark which it occupied before. By shifting the line up or down from the trace of the previous year an inch or two, will cause sad blunders in the reports of increase of circumference; to avoid which, the best plan is to procure a pot of white lead, and when the circumference is taken for the first time, make a number of small dots on the bark, and all round the tree, before the take-on string is removed.

From the foregoing suggestions, as well as by many more that might be offered, it will be seen that there is ample scope for exertion on the part of the Arboricultural Society, provided the means were equal to the need; however, the absence of means is the misfortune, not fault, of the Society.

It is certainly matter for deep regret that the mass of landlords stand so far aloof from this Association, and look down, seemingly with apathy and indifference, on the unbought efforts that are being made for the dissemination of arboricultural knowledge; efforts, both mental and physical, for important interests not their

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own. I am willing to admit that the great mass of proprietors have duties, public and private, to attend to, which prevent them from giving their personal countenance at the annual meetings, but surely this is no reason for withholding pecuniary support.

In the rising generation of foresters there must be no receding. Keep moving onward, and look for more considerate times.

Twenty and seven years ago I predicted the advent of an Arboricultural Society, and was laughed at for so doing; but it did come at last: and, note my words, I have no hesitation in predicting that in a much shorter period we shall see landlords looking somewhat more particularly to their own interests. Before accepting of a tenant for a farm, the applicant will be required to produce a diploma of qualification from some agricultural college or other authority. The diploma movement is now being agitated among the horticultural profession; and it will follow, as certainly as trees grow upward, that some such security will be required from those who aspire to the management of extensive tracts of woodland.

NORTHAMPTONSHIRE FORESTER.

To the Secretary of the
Scottish Arboricultural Society.

INVERESHIE, by KINGUSSIE,
Nov. 3, 1860.

SIR,—I am favoured with your notice of the General Meeting of the Scottish Arboricultural Society, to be held on the 7th current, and regret it is entirely beyond my power to be present that day; but as a member, I beg to trouble you with a remark or two. It must be evident to every member of the Society that the amount of instructive information diffused through the medium intended is comparatively meagre, when the great number of experienced foresters connected with the Society is taken into account.

On glancing over the Society's Transactions since its commencement, I find all the matter contained therein has been furnished by a few obliging individuals, while the great mass of members are either unwilling that their knowledge should be imparted to others, or consider a contribution to the Society below their notice.

Those who, like myself, have never had the chance of obtaining much experience, must mourn over such a sad state of things.

The object of this note is to beseech you (by any means you may think best) to bring before the meeting this unsatisfactory feature of the Society's prospects; and I anxiously hope that some means may be devised whereby a revival of interesting competition matter may be effected, else I am afraid many poor foresters will try and invest their *crown* to better advantage.

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If I may be permitted to suggest anything, I would say, let the prizes awarded for the different subjects be increased in value, and the posts of honour, such as office-bearers, &c., be assigned to members who have contributed most successfully to the Society, or advanced the science of forestry otherwise.—I am, Sir, your most obedient Servant,

GEO. FRANCE.

Mr R. M. Stark,
Edgehill Nursery, Edinburgh.

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APPENDIX (C).

GENERAL ABSTRACT OF THE ACCOUNTS

OF THE

SCOTTISH ARBORICULTURAL SOCIETY,

for 1859–60.

CHARGE.

1. Annual Subscriptions, ...	£39	1	6
2. Cash for Sale of Transactions, . .	2	7	6
3. Subscriptions paid in advance, . .	1	13	0
4. Do. in arrears paid, . .	11	10	0
5. Cash received from Bank, . . .	46	0	0
	£100	12	0

DISCHARGE.

1. Advertising, ...	£1	1	6
2. Postages, Carriages, &c., . . .	2	16	0
3. Printing, ...	46	4	0
4. Rent of Room, ...	0	5	0
5. Cash put in Bank, ...	37	9	6
6. Salary of Secretary, ...	10	0	0
7. Cash in hand of Treasurer, . . .	2	16	0
	£100	12	0

I have examined the Books and compared the Vouchers, and have found them correct.

(Signed) THOMAS METHVEN,

7th November 1860. *Auditor.*

Members are reminded of the following alterations as to Subscription Money adopted at last General Meeting:—

That the Annual Subscription for Factors be 5s., Head-Foresters 3s., and Under-Foresters 2s. each, and that there be added to Law V. a clause to the effect that any Member of the Society introducing a new member shall be held responsible for the first year's subscription of such party.

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LIST OF MEMBERS

OF THE

SCOTTISH ARBORICULTURAL SOCIETY.

(*Corrected to November* 1860.)

ADAIR, Sir Shafto, Bart., Flixton Hall, Bungay, Suffolk.
AIRLIE, Earl of, Cortachy Castle, Forfarshire.
ALEXANDER, James, Nursery and Seedsman, 1 Waterloo Place, Edinburgh.
ALEXANDER, William, Nurseryman, Banff.
ALLAN, John, Forester, Crathes Castle, Aberdeen.
AMOS, William, Assistant-Forester, Whittinghame, Prestonkirk.
ANDERSON, John, Nurseryman, Perth.
ARCHER, James, Forrester, Mount Alto, Balnayhine, Ireland.
ATHOLE, His Grace the Duke of, Dunkeld.
AUSTIN & M'AUSLAN, Messrs, Nursery and Seedsmen, Glasgow.
BALDEN, John, Lennoxlove, Haddington.
BALDEN, John, Bywell Castle, Stocksfield, Newcastle-on-Tyne.
BALLANTYNE, John, and Son, Nursery and Seedsmen, Dalkeith.
BATHGATE, A., Assistant-Forester, Bowhill, Selkirk.
BATTY, William, Forester, Netherby, Longtown.
BINNING, John, Esq., Factor, Tulloch Castle, Dingwall.
BISSET, David, Forester and Land-Steward, Alva House, Alloa.
BORTHWICK, William, Forester, Dunnichen, Forfar.
BOSSIE, James, Assistant-Forester, Auchinsale, Renfrewshire.
BOW, Andrew, Forester, Cleghorn, Lanarkshire.
BRODIE, James, Forester, Hallyburton, Angusshire.
BROUGH, Robert, Forester, Hamilton Palace.
BROWN, Charles, Esq., Factor, Gartmore, Stirling.
BROWN, Edward, Assistant-Forester, Champfleurie, Linlithgow.
BROWN, James, Wood-Valuator, Edinburgh.
BROWN, R. E., Forester, Carr Bridge, Strathspey.
BROWN, William, Esq., Factor, Invercauld, Aberdeenshire.
BUCHAN, George, Forester, Bakewell, Derbyshire.
BUIST, Matthew, Esq., Factor, Tynninghame, Prestonkirk.

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CAMERON, Archibald W. F., Esq., of Lakefield, Glen Urquhart, Inverness.
CAMPBELL, Archibald, Forester, Adderly, Market Drayton, Salop.
CAMPBELL, Donald, Forester to James H. E. Wemyss, Esq., M.P., Wemyss Castle, Kirkcaldy.
CHALMERS, John I., Esq., Aldbar, Brechin.
CHAMBERS, William, Esq., Haford, Cardiganshire.
CLARKE, John, Esq., Agent, Featherstone Castle, Haltwhistle, Northumberland.
CLARKE, Mr J., Forester to the Earl of Kintore, Keithhall, Aberdeenshire.
CLEGHORN, William, Forester, Aytoun Castle, by Aytoun.
CLUES, William, Forester, Charleton, Fife.
COWAN, James, Forester, Glenforse, Isle of Mull.
COWAN, Robert, Forester, Arniston, Gorebridge.
DARLING, John, Forester, St Martins, Perthshire.
DICK, R., Forester, Cullen House, Banffshire.
DICKSON, James, Esq. of Chatto, Coldstream.
DICKSON, James, Forester to the Earl of Seafield, Glen Urquhart, Inverness.
DICKSON and Sons, Messrs James, Nurserymen, Edinburgh.
DONALDSON, Mr, Forester, Brechin Castle, Brechin.
DUCIE, Earl of, Tortworth Court, Wotton-under-Edge, Gloucester.
DURRAN, Wm., Forester, Altguissack, Ballater.
EARNSHAW, L., Forester, Morpeth, Northumberland.
EWAN, John, Forester, Corsock House, Corsock Bridge.
FENNY, James, Forester, Fetteresso, Stonehaven.
FORBES, Thomas, Emo Park, Portarlington, Ireland.
FOWLES, R., Forester, Fordel, Aberdour.
FRANCE, George, Forester, Invereshie, Strathspey, Inverness-shire.
FRASER, P. Neill, Esq., Canonmills Lodge, Edinburgh.
GALLOWAY, Charles, Forester, Halston Hall, Oswestry, Salop.
GARDINER, Alexander F., Esq., Factor, Balnagowan, Tain.
GARDINER, Robert, Forester, Eglinton Castle, Irvine.
GARDINER, Robert, junior, Eglinton Castle, Irvine.
GIBSON, John, Esq., Land-Agent, Milton Abbey, by Blandford, Dorsetshire.
GILCHRIST, A., Forester, Auchinsale, Renfrewshire.
GORDON, John, Forester, Durris, by Aberdeen.
GORRIE, Archibald, Forester to the Duke of Norfolk, Holkam, Norfolk.
GORRIE, Peter, Forester to the Duke of Buccleuch, Dalkeith Park.
GOUGH, William, Forester, Monymusk, Aberdeen.
GRIEG, Gavin, Forester, Parkhill, Aberdeen.
GREIG, George, Esq., W.S., 9 Abercromby Place, Edinburgh.
GRIGOR, John, Nurseryman, Forres.
GUTHRIE, David, Forester, Hafodunos, Llanrwst, Denbighshire.

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HALL, Peter, Forester, Balharry, Meigle.
HAY, James, Forester to Earl of Seafield, Boyne, Portsoy.
HENDERSON, George, Nurseryman, Brechin.
HOBBS, Harry, Forester, Woodovis, Tavistock, Devon.
JOHNSTON, John, Land-Steward, Douglas Castle, Lanark
JOHNSTON, John, Assistant-Forester, Cullen House, Banffshire.
KECK, G. A. Legh, Esq., Staughton Grange, Leicestershire.
KELVRAIN, John, Assistant-Forester, Cullen House, Banffshire.
KENNEDY, Right Hon. T. F., Dalquharran Castle, Maybole.
KERR, C. Webster, Esq., Auchterhouse, Dundee.
LAMOND, William, Land-Steward to Earl of Airlie, Cortachy Castle.
LAMONT, John, of James Dickson and Son, Edinburgh.
LAWSON, Dr George, Kingston, Canada West.
LINDSAY, J., Forester, Shandon, Helensburgh.
M'CALL, Richard, Forester, Gilston Castle, Castle-Douglas.
M'CALLUM, G. K., Esq. of Braco Castle, Braco.
M'CORQUODALE, William, Forester, Scone Palace, Perth.
M'CORQUODALE, Archibald, Forester to Lord Lovat, Beaufort.
M'CORQUODALE, Donald, Forester to the Duke of Sutherland, Dornoch.
M'DONALD, John, Forester, Bridgend, Islay.
M'GREGOR, John, Forester, Tynrich, Dunkeld.
M'GREGOR, J., Forester, Lynedoch, Perth.
M'KAY, James, Forester, Newton Don, Kelso.
M'KENZIE, K. Stewart, Esq., Seaforth, Urray Cottage, Beauly.
M'LAREN, Hugh, Forester, Shaw Park, Alloa.
M'LAREN, John, Forester, Hopetoun House, South Queensferry.
M'LAREN, Mr, Forester, Darnhall, Eddleston, Peebles.
M'LEISH, A., Forester, Yetholm.
M'LELLAN, J., Forester, Galston, Kilmarnock.
M'LEOD, George, Forester, Whittinghame, Prestonkirk.
M'LEOD, James, Assistant-Forester, Whittinghame, Prestonkirk.
M'NEILL, James, Forester, Abercairny, Crieff.
M'RITCHIE, T. E., Esq., 4 Gayfield Square, Edinburgh.
MACBEATH, J., Land-Steward, Stobhall, Perth.
MACTIER, Alex. Walker, Esq. of Durris, Aberdeenshire.
MAKAY, Thomas, Forester, Loanhead, Selkirk.
MARSHALL, John, Forester, Lambton Park, Fence Houses, Durham.
MELROSE, John, Forester, Brahan Castle, Dingwall.
MENZIES, William, Forester.
METHVEN, Thomas, Nurseryman, Stanwell Lodge, Edinburgh.
MILLER, John, Forester, Gorthie, The Cairnies, Perth.
MINTO, Earl of, Minto House, Hawick.
MITCHELL, A., junior, Forester, Tullyallan, Kincardine-on-Forth.
MITCHELL, D., Forester, Amisfield, Haddington.
MOFFAT, Adam, Forester, Easton Lodge, Dunmore, Essex.
MONRO, James, Forester to the Marquis of Northampton, Easton Maudit, Northampton.

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MURRAY, David, Forester, Dunira, Perthshire.
MURRAY, John, Esq., of Touchadam and Polmaise, Stirling.
MURIE, D., Assistant-Forester, Horningsham, Longleat, Warminster, Wilts.
NELSON, J. E., Nurseryman, Rinefield, Lymington, Hants.
NELSON, W., Forester, Primrose Bank, Bootle, Liverpool.
PALMER, John, Nurseryman, Annan.
PARKER, James, Forester, Belvoir Castle, Grantham.
PATTERSON, Andrew, Land-Steward to Right. Hon. Lord Rollo, Duncrub, Dunning, Bridge of Earn.
PHILIP, Robert, Land-Steward, Auchluncart, Keith.
PORTSMOUTH, Earl of, Eggsford, North Devon.
PURVIS, Mr, Forester to Marquis of Stafford, Tarbet, Parkhill, Ross-shire.
RAMSDEN, Sir J., Bart., Buckden, Skipton, York.
RAVENSCROFT, E. J., 1 George IV. Bridge, Edinburgh.
RITCHIE, Walter, Assistant-Forester, Arniston, Gorebridge.
Robertson, James, Forester, Bolesworth Castle, Tattenhall, Chester.
ROBERTSON, P. S., Nurseryman, Edinburgh.
ROBERTSON, Thomas, Forester, The Cairnies, Perthshire.
ROBSON, Alexander, Forester, Glenalmond, Perth.
RUTHERFORD, James, Forester to Lord Douglas, Linthaugh, by Jedburgh.
RUTHERFORD, J., Forester to Sir John Ramsden, Bart., Buckden.
RUTZEN, Right Hon. Baron Frederick de, Slabeck Hall, Haverfordwest.
SANDBACK, Henry R., Esq., Hafodunos, Llanwrst, Denbighshire.
SANG, Walter, Nurseryman, Kirkcaldy.
SCOTT, Archibald, Nursery and Seedsman, 1 Waterloo Place, Edinburgh.
SCOTT, David, Assistant-Forester, Culhorn, Wigtonshire.
SCOTT, John, Assistant-Forester, Carpow, Newburgh.
SCOTT, John W., Esq., 1 Salem Place, Dublin.
SCOTT, Thomas M'Millan, Esq. of Wauchope, Hawick.
SHANKS, James, Forester, Aberlour House, Craigellachie, Banff.
SINTON, John, Assistant-Forester, Dungannon Park, Dungannon, Ireland.
SKIRVING, Archibald, Forester, Horningsham, Longleat, Warminster, Wiltshire.
SKIRVING, William, Nursery and Seedsman, Liverpool.
SLEIGH, Mr J., Manager, Strichen Castle, Strichen.
SMITH, James, Esq., Factor, Dunglass, Cockburnspath.
SMITH, James, Forester to the Earl of Moray, Donibristle, Fife.
SOMMERVILLE, Dr, 17 Hart Street, Edinburgh.
SOMMERVILLE, James, Assistant-Forester, Harewood, Leeds.
STAIR, Right Hon. The Earl of, Oxenford Castle, Dalkeith.
STARK, Robert M., Edgehill Nursery, Edinburgh.

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STEELE, David, Forester, Skene House, Aberdeen.
STIRTON, Robert, Forester to Lord Portsmouth, Eggesford, North Devon.
THOMSON, John Grant, Forester, Abernethy, Strathspey.
THOMSON, William, Deputy-Surveyor, Chopwell Woods, Ebchester, Gateshead.
TURNBULL, John, Assistant-Forester, Minto House.
TURNBULL, Thomas, Forester, Underwood, Plympton, Devonshire.
TURNBULL, William, Forester, Torr House, Auchencairn, Castle-Douglas.
TURNER, F. J., Esq., Dean House, Kilmarnock.
TWEEDIE, John, Forester, Champfleurie, Linlithgow.
WALKER, W., Overseer and Forester, Bellabeg House, Aberdeenshire.
WATSON, James, Fascadel, Strontian, Argyleshire.
WHITE, James, Assistant, Chopwell.
WIGHT, Andrew, Assistant-Forester, Buckden.
YEAMAN, William, Forester, Birkhall, Ballater.

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PRIZE ESSAYS FOR 1861.

I. Introduction and Cultivation of the newer Coniferæ and other Forest Trees, with special reference to the climate of Great Britain and Ireland (Silver Medal).

II. On the Successful Raising of Two Crops of Scotch Fir in succession on Moorland. The crop reported on to be not less than two years old (Silver Medal).

III. The Best Season for Felling Timber of various kinds; with a view to future Durability (Silver Medal).

IV. The Best Method of Rearing and Maintaining Live Fences; with an Account of the Plants best fitted for filling up Gaps in old Hedges (Silver Medal).

V. The Results of Mixed and Unmixed Plantation (Silver Medal).

VI. The Species of Timber Trees suitable to the various Soils, Elevations, and Exposures, and the effects produced on the different varieties (Silver Medal).

VII. The Rearing and General Management of Scotch Fir, Larch, Spruce, mixed and in masses (Silver Medal).

NOTICE.

The next Annual Meeting of the Scottish Arboricultural Society will be held in the Society's Meeting-Room, 6 York Place, Edinburgh, on the First Wednesday of November 1861, at One o'clock.

Applications from Gentlemen desirous of becoming Members of the Scottish Arboricultural Society, may be addressed to Mr ROBERT M. STARK, Secretary, 6 *York Place, Edinburgh*, from whom the Society's *Transactions*, copies of the *Laws*, particulars of Prizes for *Competition Essays*, and all other information, may be obtained.

Subscriptions are received by Mr JOHN ANDERSON, Nurseryman, *Perth*, the Treasurer, to whom all communications relative to the Society's financial affairs should be addressed.

Members in arrear are requested to obtain their receipts from the Treasurer without further delay.

ROBERT M. STARK, *Secretary*.

Scottish Arboricultural Society's Rooms,
6 York Place, Edinburgh.

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APPENDIX (D).

Statement regarding Time and Wages of Assistant-Foresters in the County of Fife. By D. CAMPBELL, Forester, Wemyss Castle.

IT is not, I believe, generally known to the members of the Aboricultural Society, that all the under foresters in the county of Fife work only *nine* hours a day in spring, summer, and autumn, their wages ranging from 12s. to 15s. a week. I have tried this plan in Fife for several years.

I have also for many years had trial of the *Ten* hours' labour system in other counties; and my experience of the important advantages, both to the master and to the men, which the former system possesses over the latter, enables me to recommend strongly to master foresters throughout the country the adoption of the *Nine* hours' labour system, as practised in Fife.

You all know that woodmen have generally several miles to travel to their work every morning. They consequently must have breakfast before setting out, and must necessarily, therefore, be very early astir. They take dinner at one o'clock, begin work again at two, and continue till six,—thus passing seven or eight hours from breakfast till dinner time without food, and having only one hour's interval for rest and refreshment from early morning till six in the evening. Now no man can work on continuously and vigorously for seven or eight hours without food or rest. It is a wearing-out system. He may fag on, it is true, during the alloted time; but towards the latter part of it, in proportion as his strength fails, so also must his work.

Our hours of labour are from eight o'clock A.M. till six o'clock P.M., with an hour's interval for dinner between one and two; and I testify from experience and extensive observation, that men whose labour is restricted to these hours put more work through their hands in *nine* hours, and do better, than others of equal strength and skill can do on the other plan in *ten* hours. Indeed, I consider that other workmen who can begin at six in the morning, take breakfast at nine, dinner at two, and go on till six, making in all ten hours of work daily, are better off than under foresters who work only nine hours a day, from eight in the morning till six in the evening, with only *one* hour's rest.

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APPENDIX (E).

GENERAL ABSTRACT OF THE ACCOUNTS

OF THE

SCOTTISH ARBORICULTURAL SOCIETY

for 1860–61.

CHARGE.

To Balance in Treasurer's hands,	£2	16	0
Amount of Annual Subscriptions,	18	11	6
„ Arrears of do.	11	10	0
„ Cash taken from Bank,	17	3	6
	£50	1	0

DISCHARGE.

By Paid for Advertising,	£5	8	0
„ Printing,	15	5	0
„ Postages and other Charges	3	0	3
„ Rent of Room,	0	12	6
„ Salary of Secretary,	10	0	0
„ Prizes,	1	6	3
Cash in Perth Savings Bank,	14	9	0
	£50	1	0

I have examined the Books and Vouchers, and found them correct.

(Signed) THOMAS METHVEN,
Auditor.

EDINBURGH, 6*th November* 1861.

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GENERAL ABSTRACT OF THE ACCOUNTS

OF THE

SCOTTISH ARBORICULTURAL SOCIETY

for 1861–62.

CHARGE.

To Balance in Treasurer's hands, . .	£0	7	6
Annual Subscriptions, . . .	20	17	6
„ Arrears, . .	9	15	0
	£31	0	0

DISCHARGE.

By Paid for Advertising, . . .	£2	1	3
„ Printing, . . .	10	12	10
„ Use of Room, . . .	0	7	0
„ Postages and other Expenses, .	6	13	1
„ Salary of Secretary, . .	10	0	0
Balance in Treasurer's hands, . .	1	5	10
	£31	0	0

I have examined the Books and Vouchers, and have found them correct.

(Signed) THOMAS METHVEN,
Auditor.

EDINBURGH, *5th November* 1862.

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APPENDIX (F).

LIST OF MEMBERS

OF THE

SCOTTISH ARBORICULTURAL SOCIETY.

(*Corrected to 5th November* 1862.)

** *Honorary Members.* * *Life Members.*

*ADAIR, Sir Shafto, Bart., Flixton Hall, Bungay, Suffolk.
AIRLIE, Earl of, Cortachy Castle, Forfarshire, *President.*
ALEXANDER, James, Nursery and Seedsman, 1 Waterloo Place, Edinburgh.
ALEXANDER, William, Nurseryman, Banff.
ALLAN, John, Forester, Crathes Castle, Aberdeen.
ANDERSON, John, Nurseryman, Perth, *Treasurer.*
ARCHER, James, Forester, Mount Alto, Balynahinch, Ireland.
ATHOLE, His Grace the Duke of, Dunkeld.
AUSTIN and M'AUSLAN, Messrs, Nursery and Seedsmen, Glasgow.

BALDEN, James, Forester, Lennoxlove, Haddington.
**BALFOUR, J. H., M.D., Regius Professor of Botany in the University of Edinburgh.
BALLANTYNE and SON, Messrs John, Nursery and Seedsmen, Dalkeith.
BATHGATE, A., Assistant-Forester.
BATTY, William, Forester, Netherby, Longtown.
BINNING, John, Factor, Brae, Dingwall.
BISSET, David, Forester and Land-Steward, Alva House, Alloa.
BORTHWICK, William, Forester, Dunnichen, Forfar.
BOUSIE, Robert, Assistant-Forester.
BOW, Andrew, Forester, Cleghorn, Lanarkshire.
BRODIE, James, Forester, Hallyburton, Forfarshire.
BROUGH, Robert, Forester, Hamilton Palace.
BROWN, Charles, Factor, Gartmore, Stirling.
BROWN, Edward, Assistant-Forester, Cardross, Stirlingshire.

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BROWN, James, Wood-Valuator, Bordeaux Cottage, Liberton, near Edinburgh.
BROWN, R. E., Forester, Wass, Oswald Kirk, Yorkshire.
BROWN, William, Factor, Invercauld, Aberdeenshire.
BUCHAN, George, Forester, Bakewell, Derbyshire.
BUIST, Matthew, Factor, Tynninghame, Prestonkirk.

CAMERON, Archibald W. F., Esq. of Lakefield, Glen Urquhart, Inverness.
CAMPBELL, Archibald, Land-Agent, Whitmore, Newcastle, Stafford.
CAMPBELL, Donald, Forester to James H. E. Wemyss, Esq., M.P., Kirkcaldy.
CHALMERS, John I., Esq., Aldbar, Brechin.
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DUNCAN, William, Forester, Airthrey Castle.

EARNSHAW, L., Forester, Morpeth, Northumberland.
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GORRIE, Archibald, Forester to the Earl of Leicester, Holkham.
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GREIG, Gavin, Forester, Parkhill, Aberdeen.
GRIGOR, John, Nurseryman, Forres.

HADDOW, James, Assistant-Forester.
HALL, Peter, Forester, Balharry, Meigle.
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Sadler, John, Assistant to Professor of Botany in the University of Edinburgh, *Secretary*.

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WATSON, James,
WILSON, John, Professor of Agriculture, University of Edinburgh.

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NOTICE.

The next Annual General Meeting of the Society will be held on Wednesday, 4th November 1863, at One o'clock P.M., in the Society's Rooms, 5 St Andrew Square, Edinburgh.

All Subscriptions and Communications relative to the Society's Financial Affairs to be forwarded direct to Mr JOHN ANDERSON, Nurseryman, Perth, the Treasurer, and *not through* the Secretary.

Applications from Gentlemen desirous of becoming Members of the Society, to be addressed to Mr JOHN SADLER, Secretary, Royal Botanic Garden, Edinburgh, from whom the Society's Transactions, Copies of the Laws, and all other information, may be obtained.

Members are requested to notify to the Secretary any change in their Address.

JOHN SADLER, *Secretary.*

SCOTTISH ARBORICULTURAL SOCIETY'S ROOMS,
5 ST ANDREW SQUARE, EDINBURGH.

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